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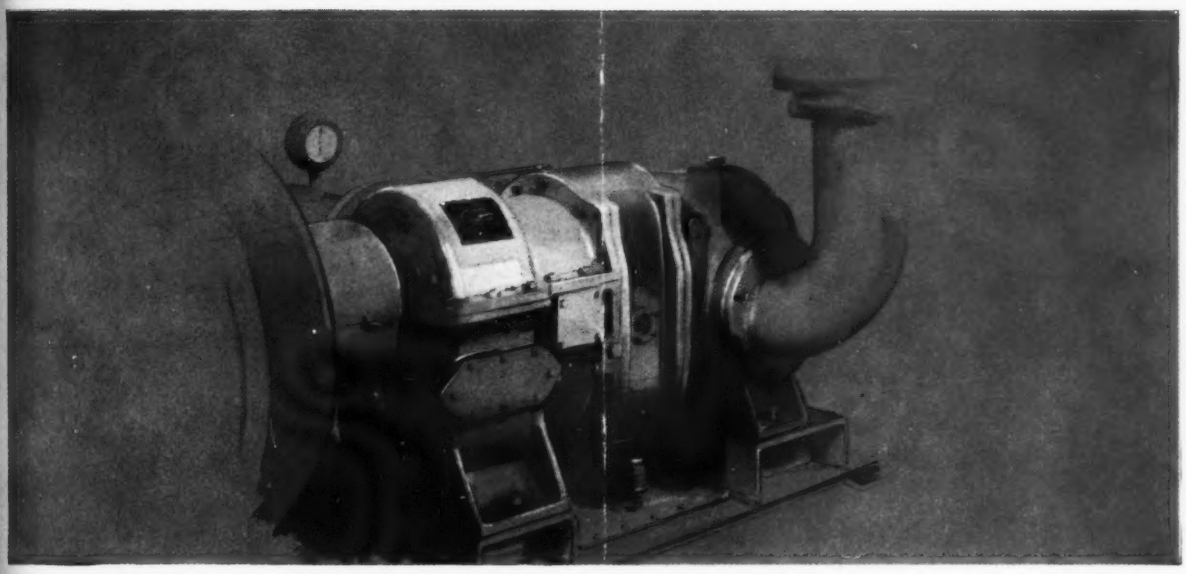

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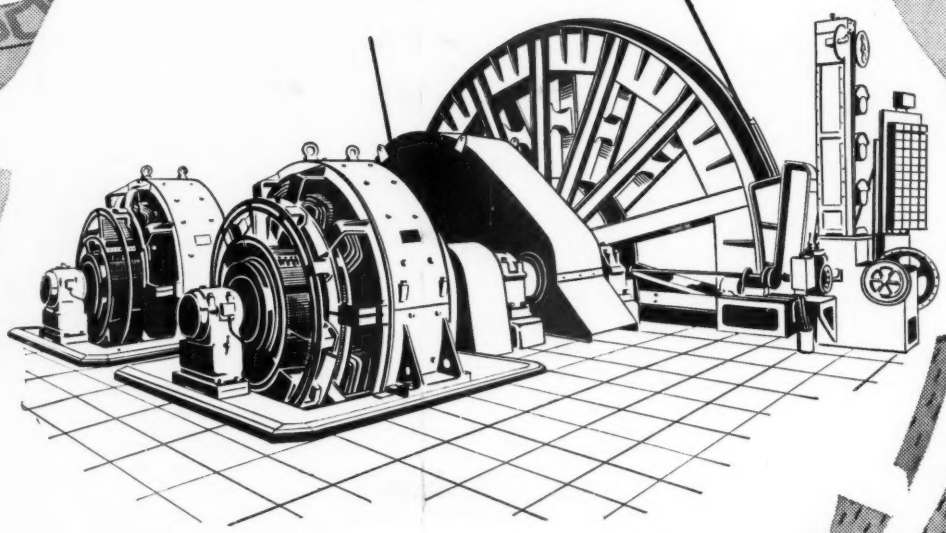

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The Mining Journal

London, May 8, 1959

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Editor
U. Baliol Scott

Deputy Editor
A. Graham Thomson

Assistant Editor
R. Bowran

Assistant Financial Editor
R. A. Nuttall

Display Advertisement Manager
E. S. Hooper

Circulation
Robert Budd

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E. Baliol Scott (*Chairman*)
U. Baliol Scott (*Managing*)
G. A. Baliol Scott
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Doctor Jekyll and Senor Hyde?

ONE of the allegorical romances of the late James Branch Cabell tells of a searcher after knowledge who enquired of a many-headed idol which of the many religions and philosophies was the truth. And the god replied simultaneously through each of his many hundred mouths and each mouth said something different.

There is something a little reminiscent of this disconcerting experience in the conflicting statements of government policy and intentions emanating from Mexico which taken together convey the impression of a kind of political schizophrenia?

On April 2 the Minister for National Resources, Senor Bustamente — evidently speaking on this occasion on behalf of Senor Hyde—was reported to have stated in a TV appearance that the government regarded all minerals as belonging to the State, and that in future no concessions to exploit mineral deposits or petroleum would be granted to private firms or to foreign groups. In this connection, the Minister claimed that the Altos Hornos plant, originally belonging to Fundidora de Monrerrey, had expanded production since nationalization by 300 per cent, while its former owners had increased output by only 20 per cent over a similar period, conveniently forgetting that the finance for increasing the capacity of this plant was made possible in the first place by the taxation yield from private industry.

Barely a month later a radical change of policy, at least in the State of Chihuahua, was announced by Pablo Lucera Rios, agent of the Mexican Bureau of Mines, in connection with new radioactive mineral deposits located by the Mexican National Nuclear Energy Commission. Hitherto, the government's policy (Senor Hyde obviously in the ascendant) has been to declare radioactive minerals federal resources, with the result that prospectors have not been conspicuously eager to hunt for uranium minerals.

Now, as Doctor Jekyll, the government has indicated through Rios, speaking as the voice of the federal bureau, that "every facility will be provided to all persons dedicated to mining activity who discover radioactive minerals". The State Government, according to Rios, is prepared to offer "magnificent contracts" in which will be stipulated the "guarantee" of purchasing total production at prices prevailing in world markets. This is certainly a reversal of former practice, when the discoverer received nothing from the government, the find reverted to national resources, and the owner of the land, if any, received a purely nominal payment. Though the picture may now be changing, it is perhaps scarcely surprising that a feeling of uncertainty still exists and no private finds have as yet been reported in Chihuahua State.

No less symptomatic of the split personality which can be discerned in Mexican Government policy, is the quite bewildering incompatibility, which apparently exists between the Adminstration's constantly professed concern for the mining industry (kind Dr. Jekyll!), and the crippling burden of taxation to which the mining companies are chronically subjected (Oh, bad and foolish Senor Hyde!).

In a recent report to the Federation of Industrial Chambers, the Chamber of Mines asserted that the biggest cost item was still the production and export taxes that Mexican miners had to pay, even when they did not make any profits. The two taxes, on production and exports, it was stated, represented about 33 per cent of the cost of production. When all the other taxes were added, the total fiscal load was about 40 per cent of production costs.

On April 23, it was reported that steps were being considered by the Mexican Federal authorities towards an effective reorganization of the nation's mining industry. Sr. Salvador Pena, Under-Secretary of Non-Renewable Resources, was quoted as stating that one of the major steps now under consideration by President Adolfo Lopez Mateos would include government loans and technical assistance to small and medium-sized mines. One of the first moves under this new government plan would be legislative changes in the mining laws now in force. Sr. Pena also said that whoever acquired the right to exploit a mineral deposit would be required to act on it. Mining concessions would either be worked within a reasonable length of time or be lost—which is fair enough and certainly a horse of a very different colour from the non-starter attributed to Sr. Bustamente in his TV interview.

Amid all this inconsistency and confusion one fact alone appears to be indisputable: that prospects for the Mexican mining industry remain dark and more and more small mines are being forced to stop operations. We can but hope that the government is at last beginning to see the warning signals and that this time Dr. Jekyll is truly here to stay.

TRENDS IN WORLD PRODUCTION

The *Statistical Yearbook 1958*, a bilingual publication issued by the United Nations (in French and English), shows the remarkable increase in world production that has occurred in recent years. Of particular interest to the mining industry are tables showing production of a wide range of minerals during the years 1937-57. Analysis of the statistics reveals significant trends in the relationship between the output of minerals and the volume of goods produced.

The volume of goods produced in the world as a whole (excluding the U.S.S.R. and the countries of Eastern Europe and Mainland China) had about doubled between 1938 and 1957. The greater part of this increase was due to the expansion in the output of manufactured goods, which increased by almost one and a half times in the period. The volume of primary production (agricultural and mineral products) showed a much lower increase—40 per cent.

The greater part of these increases took place in the period following the year 1948, which may be regarded as the beginning of the post-war period of reconstruction expansion. Between 1948 and 1957, production of primary commodities increased by 25 per cent, while the volume of manufactures increased by 65 per cent. Between 1938 and 1957, even the comparatively modest increase of 40 per cent in the volume of primary products was achieved only with the help of a very great increase in mineral output, which includes the large expansion of crude petroleum production.

The remarkable expansion in the volume of manufacturing activities, unaccompanied by corresponding increases in the volume of raw materials is evidence of the extent to which the demand of the world's population for highly processed manufactures continues to increase. It is clear from the data that a given volume of raw materials is, in the modern world, being subjected to more extensive and more complicated processes of manufacturing before being consumed. This accounts for much of the increase in manufacturing output, since the total volume of output is a measure of the value which has been added to the raw materials in the manufacturing process.

The expansion in the processing of minerals bore a similar relationship to the expansion in the mineral extracting industry. Within the field of manufacturing proper, there is evidence that the goods emerging from the industrial system are becoming more and more highly fabricated; thus between 1948 and 1957 the output of metal products expanded by 87 per cent, while the basic metals output of industry expanded by only 64 per cent.

The expansion in the volume of world activity was substantially greater in the heavy industries—i.e. those concerned with mineral processing—than in the light industries processing products of agriculture and forestry. Between 1948 and 1957, the volume of activity doubled in the manufacture of chemicals, petroleum, and coal products, and almost reached the same level in the expansion of manufacturing of metal and non-metallic mineral products.

The very great expansion in manufacturing suffered a serious setback in the fourth quarter of 1957, when North American output, contrary to the normal seasonal rise, was lower than that of the third quarter. This North American downward trend continued into the second quarter of 1958. As a result, world output remained stationary throughout the first three-quarters of 1958, and the volume of industrial output in this period was 4 per cent below that of the first nine months of 1957 and only just reached the 1957 level.

In individual industries, the greatest reductions in world output in 1958 as compared with 1957 were a 15 per cent decrease in the basic metal products and a 6 per cent reduction in the related activities of coal and metal mining, and the metal products industries.

As regards individual minerals, world (excluding U.S.S.R.) production of copper ore (in terms of copper content) increased by only 1 per cent in 1957 compared with the previous peak production of 1956; the percentage increases in 1956 and 1955 over the previous years were 11 and 10 per cent respectively. Compared with 1948 and 1938, world production increased in 1957 by 44 per cent and 63 per cent respectively.

World (excluding U.S.S.R.) production in 1957 of lead ore (in terms of lead content) increased 6 per cent over 1956, 53 per cent over 1948, and 22 per cent over 1938. The world (excluding U.S.S.R.) production of zinc ore in 1957 was about the same as in 1956, 56 per cent higher than 1948 and 137 per cent more than 1938.

In 1957, the United States and the U.S.S.R., the two greatest producers and consumers of steel, were also the two greatest producers of iron ore, their combined output being over 50 per cent of the world total. The production of both countries was 8 per cent above 1956. While the output of the United States was 9 per cent above 1948, that of the U.S.S.R was over 200 p.c. more than the 1948 figure. World (including U.S.S.R.) production in 1957 of iron ore (in terms of iron content) increased by 7 per cent over 1956, by 94 per cent over 1948, and by 170 per cent over 1938.

ASSISTANCE TO GOLD MINING IN AUSTRALIA

Australia's Gold Mining Assistance Act will expire on June 30, and representations to the Commonwealth Government have been made by the Chambers of Mines of Western Australia, Victoria and Queensland and by the Northern Territory producers, for the renewal of the

Act, for without the aid so given, the gold mining industry would be in a serious position.

Modifications are also asked, including an increase in the rate of subsidy. The existing rate is three-quarters of the cost of production in excess of £A13 10s. per oz. with a maximum of £A2 15s. for large producers, and it is asked that the rate be increased to £A3 10s. per oz., with increased assistance to marginal mines, smaller mines to receive an equivalent subsidy, instead of a flat rate as at present.

It is also asked that a special development allowance should be made and that prospecting for gold should be encouraged by a subsidy of £1 for £1 on diamond drilling. Government loans are also requested to assist in bringing approved enterprises into production.

The Commonwealth Government's response to these pleas has been to announce the introduction of legislation next week to increase the subsidies to major producers to £A3 5s. (5s. less than asked) and to raise the flat rate payable to small producers from 40s. to 48s. per oz. The government has thus not seen its way to place the small producer on the same formula basis as the bigger mines.

Since the subsidy system was first introduced by the government in 1954, subsidy payments to June, 1958, have amounted to £A1,653,284 and provision was made for £A900,000 for the 1958-1959 period. Western Australia is one of the Commonwealth's major gold producers.

MINERAL INVESTIGATIONS IN MALAYA

The second of the six bulletins to be issued by the Geological Survey H.Q., Federation of Malaya, dealing with the report of the airborne magnetometer and scintillation counter survey, carried out in 1956-57 under Colombo Plan arrangements, has now appeared. The latest bulletin covers parts of the States of Kedah and Perlis and indicates several areas considered worthy of closer investigation.

Director of the Geological Survey, Dr. J. B. Alexander, in an interpretative summary of the technical report, divides the area into two parts—North-West Kedah and South Perlis, and South-West Kedah. The first comprises that part of Kedah north of Alor Star and West of Naka together with the southernmost portion of Perlis. The western portion is mostly a wide coastal alluvial plain covered by irrigation schemes and utilized for paddy cultivation. On the eastern side the country is hillier, rising in some places to 2,000 ft. above sea level. Of this area Dr. Alexander says that there is no indication in the western portion of any new discovery of major economic importance, but magnetic anomalies registered in the north-eastern part near the southern end of the tin-bearing Sintok granite mass indicate a possibility of economic mineral deposits occurring at depth, probably within 200-300 ft. of the surface.

The South-West Kedah area comprises that part of Kedah south of Alor Star and west of Naka and includes the Kedah Peak (Gunong Jerai) area in the extreme south-western portion of Kedah. The western portion is mainly composed of a coastal alluvial plain from which the mountainous Gunong Jerai massif rises to a height of 3,992 ft. In this area, Dr. Alexander points to four major zones of interest. In the south-eastern portion similar magnetic anomalies to those registered near Sintok occur and probably mark the western boundary of the Gunong Perak granite mass.

The technical report refers to a single zone of minor positive and negative trends which indicate a possible fault or contact zone running from the Sungei Pendang, south-east of Alor Star, almost due east to the Sungei Muda. The causes of this, according to Dr. Alexander, are uncertain, but may be due in part to sulphide mineralization. He recommends detailed examination by field ratemetre and geochemical survey. Subsequent geological survey, consequent on a recorded anomaly, in the coastal paddy area opposite Pulai Banting has revealed the presence of a certain amount of iron ore.

Anomalies in the south-western portion of the area express the fairly well-known magnetite bearing zone of the Gunong Jerai complex. Here investigation by dip-needle or magnetometer survey is recommended.

One of the anomalies, considered to be of major interest, is thought likely to yield more ore than is known so far from ground surveys. The known deposits on Bukit Ahan and Bukit Tupah now appear to be only part of the total anomaly, which is situated partly in the Gunong Jerai Forest Reserve and partly in mining land being worked for iron ore by the Malayan Mineral Development Corporation.

Other anomalies in the vicinity are recommended for further investigation, one of which, near to the iron ore mine operated by South Island Mining Co. in Toh Pawang Estate, is in the vicinity of a district in which a number of tin-mining applications have been refused, owing to the hilly nature of the ground and its unsuitability for gravel pumping. A contact zone in this area is suggestive of mineralization. The area is known for its tin ore and columbite mineralization and prospecting should be extended along the zone indicated.

Dr. Alexander concludes his summary with the comment that the publication of this part of the aeromagnetic report will probably result in a flood of mining applications, but the Kedah Government will not thereby be caused undue embarrassment as most of the areas of interest are already covered by agricultural or mining alienation, or by prospecting licences.

GABON IRON ORE DEPOSITS

A new company called the Society of Iron Mines of Mekambo with a capital of 200,000,000 African francs, has been founded to study iron ore deposits in north-east Gabon and eventually mine them if results prove encouraging.

Results must disclose at least 500,000,000 tons of iron ore with 60 per cent of iron to make exploitation profitable. Mining operations of the area would require a 700-kilometre railway linking the mine to the port of Pongara on the Gabon Estuary, they said. Already about 200,000,000 tons of iron ore have been discovered in the Boka-Boka mountain range. Officials estimated that it would take five years to carry out geological surveys and preliminary studies for a rail line route. A second five-year period would be needed to build the railway and start the mining operations. The actual work now under way will cost about 1,000,000,000 African francs and it is possible that expenses may reach 125,000,000,000 African francs if construction of the railway is undertaken.

Stockholders in the Society are the Office of Mines, the Bank of Paris and the Low Countries, a group of French iron and steel interests, the Suez Canal Society, the Overseas Finance Company, the West German iron and steel industry, the Italian Fiat firm, the Belgian and Dutch iron and steel industries, and the United States Bethlehem Steel Co. which alone holds 50 per cent of the stock. Shareholders under the statutes of the Society are obliged to take delivery of the ore in proportion to their capital holdings.

Wider Uses for Lead and Zinc

THE lead and zinc industry is passing through a period of difficulty and uncertainty. A Bill to "stabilize" United States domestic market prices by means of new and higher import quotas will shortly be presented to Congress. The third international conference in a series of discussions on the problems of lead and zinc producers has just been held under United Nations auspices in New York. Voluntary cuts in output and exports of both metals have been announced by leading producers, and others are believed to be pending.

Against this rather dismal background, the optimistic tenor of papers presented at the annual meetings of the American Zinc Institute, the Lead Industries Association, and the Metal Powder Industries Federation, is to be welcomed as a refreshing and timely expression of confidence in the future of these traditional and highly essential metals.

Zinc's Dynamic Prospects

According to Mr. Charles R. Ince, vice-president and sales manager of the St. Joseph Lead Co., in his address to the American Zinc Institute, consumption of slab zinc in the United States this year will be approximately 960,000 s.tons, an increase of 17 per cent above the 1958 usage of 821,000 tons. This forecast is based on the FRB Index of Durable Manufactures, which in the past has proved a fairly reliable indicator of zinc use. Surveys indicate that the index will rise this year by about 10 per cent to 159, on which basis the use of zinc per index number would be 6,000 tons—a conservative figure in view of the average for the past seven years.

In further support of his prediction, Mr. Ince pointed out that the two largest zinc-consuming industries are steel and die casting, which together account for about 80 per cent of zinc usage, and both are growing markets.

Zinc Outside the U.S.A.

Mr. R. Lewis Stubbs, director of the Zinc Development Association, Great Britain, took as his subject "Zinc outside the U.S.A., with special reference to Russia". Pointing out that during the last three years output and use of zinc outside the United States had shown steady increases, Mr. Stubbs said that last year non-U.S. zinc production exceeded 2,000,000 tonnes, an increase of more than 10 per cent since 1955, while consumption rose in the same period by 7 per cent.

Mr. Stubbs also told the meeting of his recent visit to Russia, the world's second largest zinc producer and consumer. Mr. Stubbs placed Russian zinc production last year at between 330,000 and 350,000 tons. While Russia claims the largest proved record of zinc resources in the world, fabrication of the metal is not so advanced as in the West, but potential consumption in the U.S.S.R. is so enormous as to preclude any danger that the Communist countries will become net exporters of zinc.

There was every evidence, said Mr. Stubbs, that despite quotas, tariffs, and attempts at unilateral solutions to common problems, world zinc markets would show a rapid expansion.

Dr. Schrade F. Radtke, director of the American Zinc Institute-Lead Industries Association Expanded Research Programme, reported on a number of projects sponsored by lead and zinc producing companies in the United States, Canada, Great Britain, Holland, and Australia.

New lead-base alloys, superior to those now known, are being developed and subjected to systematic evaluation of recrystallization kinetics. Other applications of lead currently being studied include continuous extrusion of lead cable, sheathing, fibre reinforced lead, lead chemicals, ceramics, and investigation of the thermal and spectral emissivity of lead compounds.

In regard to zinc, Dr. Radtke instanced an investigation at Battelle Memorial Institute on improved electroplated coatings for zinc die castings, which has shown that two newly improved plating approaches already in commercial use provide dramatically increased corrosion resistance. An extensive programme is also being conducted on zinc oxide paint formulations for exteriors of dwellings. A study in progress at the Case Institute of Technology is aimed at the development of new galvanizing alloys for improved domestic hot-water tank performance. Yet another project will explore ways and means of extending the service life of zinc lithographic printing plates for extremely long runs. Research is also being undertaken on the cathodic protection of maritime tankers with zinc anodes and on comparative corrosion-evaluation tests of various forms of zinc-protected steel sheet.

Prospects for Lead

A bright outlook for the tetraethyl lead industry was foreseen by Mr. J. A. Costello, vice-president of the Ethyl Corporation. Discussing the inroads that had been made by the refining process of catalytic reforming since 1954, when the first reformers were installed, Mr. Costello said that catalytic reforming had since increased to almost 2,800,000 b.p.d. Based on crude capacity, this represented almost 20 per cent. The effect of this process is to increase the base octane quality of petrol before it is blended with tetraethyl lead. If catalytic reformers did not exist and all the octane quality for petrol was obtained by tetraethyl lead, it is estimated that the tetraethyl lead industry would be using 250,000 tons of lead per year instead of the 160,000 tons it consumed in 1958.

Fortunately there is a limit to the amount of petrol that can be economically processed through catalytic reforming equipment, and it would appear that this is 20 per cent of crude capacity. From now on, therefore, the use of tetraethyl lead will presumably grow proportionately to the increase in petrol volume and improvement in the anti-knock quality of the fuel. At present, the average premium petrol is about 99 octane and regular grade about 92 octane. Within the next five years premium petrol might reach an octane number as high as 102-104 and regular grade might go up to 95.

In the absence of any serious business recession, and assuming that no substitute appears on the horizon which will displace lead for anti-knock use, the growth factor of the tetraethyl industry is expected to be approximately 5 per cent per annum at a conservative estimate.

Mr. Evans Taylor, Chicago branch manager of Exide Industrial Division, Electric Storage Battery Co., considers that electric vehicles powered by lead storage batteries will gain wider acceptance in the next few years. Among the advantages cited for lead-battery powered industrial trucks

are the absence of fumes, less risk of fire, smoother operation, low depreciation costs, low maintenance costs, lower operating costs, and highly manœuvrable trucks, since truck designs are not restricted by the size and shape of internal combustion engines. Last year, the storage battery industry in the United States consumed 307,673 tons of lead.

Mr. Robert L. Ziegfeld, secretary-treasurer of the Lead Industries Association, reviewed the newer uses of lead and the work that the Association is undertaking to develop new outlets for the metal. Among the uses cited were: semi-conducting properties of lead telluride, which have been used in a light-weight generator for rockets; pearlescent lead pigments for projection screens; porcelain enamels; and protective shielding in the world's first atomic merchant vessel.

New developments in lead pigments were outlined by Mr. David M. Borcina, assistant to Mr. Ziegfeld. Mr. Borcina pointed out that there are a number of other lead pigments used by this important consuming industry which exceed the better known white and red pigments in total tonnage required. The United States paint industry actually uses a minimum of approximately 60,000 net tons of lead annually, so that it is still a major consumer of lead. This figure does not include the amount of pig lead used in manufacturing such paint pigments as lead silico chromate, basic silicate white lead, "Blakled", lead naphthenate, lead molybdate, and a host of other lead pigments.

In a paper presented to the Metal Powder Industries Federation, Mr. Ziegfeld said that lead powder was finding new applications that bore little relationship to the metal's more established uses.

In preliminary work carried out for the Lead Industries Association, it was found that thin sheet lead could be produced from lead powder which would have approximately double the tensile strength of similar sheet lead made by conventional methods of casting and rolling. Furthermore, these preliminary tests indicate that the strength is retained at much higher temperatures than in the case of ordinary lead; in other words, that strength loss is much less as the temperature is increased.

As an example of the possibilities arising from the mixing of lead with other materials, a field in which considerable latitude has been found to exist, Mr. Ziegfeld cited a mixture of lead with polyethylene to produce moulded mechanical parts, such as a small flywheel for a tape-recorder.

Reference was also made to the use of lead powder in a sound-deadening material employed in many of the most modern aircraft on commercial airlines. This was described as being "of special interest", inasmuch as the value of lead for sound deadening is just becoming widely recognized, and because this application is about to become the subject of a major research effort on the Association's part, which might lead to lead's use for this purpose in many structures other than aircraft.

To conclude with a quotation from Dr. Radtke's paper, it should be realized "that lead and zinc have a major contribution to make to our technical world".

Uganda's Mineral Production in 1958

IN 1958, the total estimated value of Uganda mineral production, excluding salt, but including limestone, was £2,369,335, of which copper accounted for almost £2,120,000, reports the Mines Department.

Kilembe Mines Ltd., in Western Uganda, continues to expand operations, and produced a total of 10,831 tons of blister copper in 1958. New plant and an additional opencut were ready for operation at the end of 1958, and by the end of 1959 mining and milling capacity is expected to reach 60,000 tons of ore per month. Cobalt concentrates are to continue being stockpiled. The new opencut is in an oxidized zone, and this ore will benefit the smelter at Jinja. Present practice at the Jinja Smelter is to treat the mine concentrates without prior roasting.

Development to open up extensions of the present orebodies at Kilembe is in hand, and two new horizons are being opened. One at the 4,300 ft. level will open those bodies beneath the present workings, and one above the 6,000 ft. level will open orebodies above the present workings. Regional mapping of the 303 square miles of special exclusive prospecting licences held by Kilembe Mines Ltd. continues.

Work by Sukulu Mines Ltd. on the large phosphate and pyrochlore deposits near Tororo was largely confined, during 1958, to the erection and running of a pilot plant to establish optimum operating conditions for pyrochlore concentration. This work was substantially completed at the end of the year, with satisfactory results. Commercial exploitation of the deposit is delayed by capital-raising difficulties which have yet to be overcome. The company's original scheme to produce 100,000 tons per year of apatite concentrates, together with pyrochlore concentrates containing 1,000,000 lb. niobium pentoxide, was expanded fourfold to obtain the most economic operation. On this basis a profitable operation could be shown, but the substantial capital involved and the slowness of development of large-scale usage of niobium has so far tended to deter investment.

Production of galena went up to 292 tons from a total of 22 tons in 1957. The entire production came from the Kitaka Mine on the Ankole-Toro border. The present owners, Unicorn Mines Ltd., who exercised their option, have been very active during the year carrying out geochemical surveys, assisted by the Uganda Geological Survey. Work on the Kitaka Mine itself has proved disappointing in some respects, but many anomalies round about are being examined, and diamond drilling from surface and underground stations is in hand.

The catastrophic fall in wolfram prices has completely depressed the wolfram mining, and out of four main producers three remain open. These three mines are on a care-and-maintenance basis. One mine has just installed a 400-ton/day plant with machinery bought when prices were high.

Tin production was maintained at last year's level, but in spite of steady tin prices the promise of a revival of mining early in the year was not fulfilled.

Production of bismuth concentrates increased this year, because the fall in wolfram prices enabled one of the wolfram operators to transfer his energies to the development of a bismuth mine in Kigezi District. This mine is still at the grass-roots stage and its future is uncertain.

Beryl production was maintained, and a new discovery in Kigezi District gave fresh impetus to prospecting round about. The United Kingdom Atomic Authority have a team of geologists in Uganda examining the known beryl-bearing pegmatites with the object of assessing the potential of these orebodies.

Automatic Coal Blending System

FOR many years the Vesta and Shannopin mines at East Fredericktown, Pennsylvania, have supplied a major portion of the high-grade metallurgical coal necessary for coke production at Jones and Laughlin Steel Corporation's plants at Aliquippa and Pittsburgh. After mechanical loading facilities were installed during World War II, the Vesta-Shannopin operation was enlarged to include complete preparation facilities, making it the world's largest coal preparation plant. The latest addition to this mechanization programme has been the construction of facilities for mixing coal from the Shannopin mine upstream on the Monongahela River with the output of the Vesta mine.

Mixing of these two coals is regulated by a completely automatic weighing and proportioning system. After several months of operation, the proportioning system has proved completely successful in controlling the mixing in spite of variations in the Vesta flow.

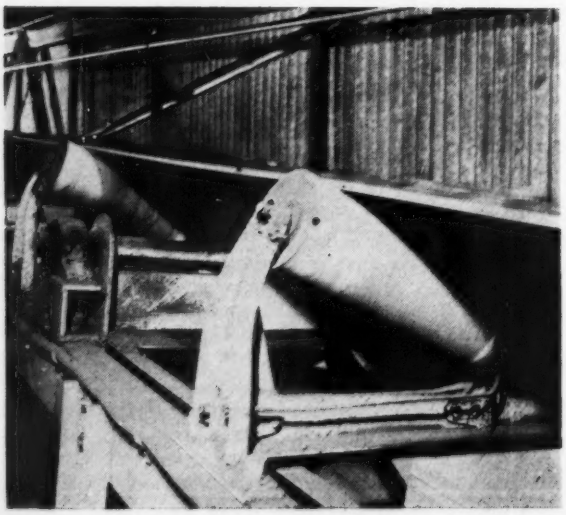
Prior to the installation of the continuous proportioning system, coal from both the Shannopin and Vesta mines was transported down the river by barges directly to the mills. It was decided that the entire operation could be streamlined and operated more economically by mixing the outputs of the Vesta and Shannopin mines at the East Fredericktown preparation plant—and then transporting the mixed coals by barge to the mills.

Following this decision, consulting engineers were engaged to design and construct the necessary facilities at East Fredericktown. Automatic weighing and proportioning equipment was required and eventually an electronic system, engineered and built by the Trans-Weigh Company, Pennsylvania, was selected and installed.

High-volatile Vesta coal from the local mine is unloaded by two rotary dumps into a common hopper. After initial screening and crushing in a chamber approximately 170 ft. below ground level, an apron feeder transports the coal above ground. The coal is then carried across a suspension bridge spanning the Monongahela River on a belt conveyor about 2,000 ft. long.

There is very little storage capacity in this phase of the system—costs for bins, feeders, and the like, to provide extensive capacity were prohibitive. Lack of adequate storage capacity made it impracticable to provide minute-to-minute control of the primary flow.

Shannopin coal is unloaded from barges and transported by belt conveyor to ten bins having a total capacity of about 5,000 tons. Ample storage capacity was chosen to permit two-shift operation of the preparation plant with



Above is the Jones and Laughlin coal preparation plant at East Fredericktown. Alongside, at left, the scale carriage for the trans-weigh Shannopin scale

one-shift unloading of the barges. Since there is always excess coal available, accurate proportioning can be accomplished by controlling the flow rate of the Shannopin coal in proportion to the Vesta coal.

Each bin is equipped with a belt feeder—speeds of all feeders are controlled together by one rheostat—but up to five of the feeders may not be in use at any one time. A collection belt carries Shannopin coal from the feeders at an average rate of about 600 t.p.h. to an inclined conveyor that in turn transports the material to the juncture of the two flows. The resulting mixture of Vesta and Shannopin coals is then conveyed to the preparation plant for final processing.

Measuring System Operation

The Trans-Weigh system measures the weight of material on a short section of the belt, and also the belt speed, and then multiplies these two variables electronically to obtain the lb. per hour being delivered.

The three primary components of this system include: (*a*) an electric tachometer generator driven by the return belt, which measures belt speed and supplies current to the weighing system; (*b*) an electric strain gauge load cell, which measures the belt load; and (*c*) a specially modified electronic potentiometer, which indicates and records instantaneous rate of flow and also includes an integrator which displays totalized tonnage on a small counter.

In the Vesta-Shannopin coal proportioning system, the Vesta flow is detected by a scale comprising a load cell and tachometer generator located part way across the bridge; while the Shannopin flow is measured by a similar scale located just after the loading point on the inclined conveyor. Location of the Vesta detecting devices was selected so as to make the time-lags approximately equal between each scale and the junction point. Thus, when Vesta tonnage varies, the control system immediately affects a proportional change in the Shannopin feed rate, and the two changes meet at the junction point at the same time.

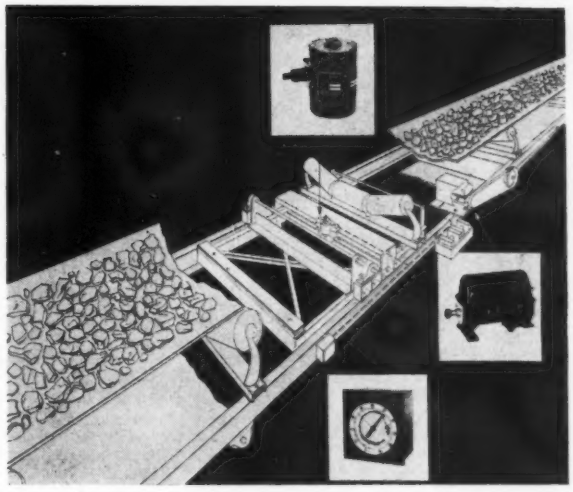
Both Vesta and Shannopin feed rates are transmitted to a central control station near the junction point. Vesta output and totalized tonnage are also retransmitted about another 1,000 ft. to a duplicate instrument in the superintendent's office.

Automatic Proportioning

Automatic proportioning is accomplished by the following sequences. The operator sets the desired ratio of Shannopin-to-Vesta flow by a calibrated dial adjustment on the ratio adjuster. The ratio adjuster receives flow signals from the recorders proportional to actual measured feed rates. These measured and desired feed rate signals are compared and the difference is an error voltage which goes to the controller. The controller, through a motor and rheostat, then increases or decreases the speed of the feeders to bring the error voltage back to zero.

If the conveyors should stop, such as when a belt accidentally trains off to one side and trips a limit switch, the control motor is driven to the low-speed position by an interlock.

Performance of the proportioning system is illustrated by segments of the instrument charts. Both segments illustrated are from 24-hour circular charts having 15-minute time divisions. The top chart section shows the Vesta, or uncontrolled, flow rate; the bottom section illustrates Shannopin flow.



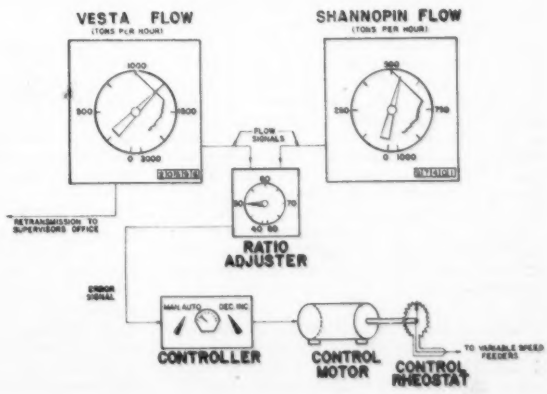
Components of basic belt meter weighing system

Variations of 10 per cent occur often over periods of about 10 minutes, and peaks of 25 to 30 per cent occur occasionally. The control problem is to make the Shannopin feed follow these variations—which it did, as shown by the bottom chart section that recorded the Shannopin feed at the same time as the Vesta feed.

The system was started with control on automatic at the right side of the charts (time increases from right to left in this illustration), and the Shannopin flow rate came up to 600 t.p.h. without overshooting. The large peak on the left of the Vesta record was paralleled on the Shannopin record, after which a brief shutdown took place, and the system was restarted—all while still on automatic. Peaks and valleys in the Vesta record are closely followed by the Shannopin record. Occasional peaks in the Shannopin flow occurred when a new feeder was turned on.

Advantages of the system include not only the solution to the original problem of providing a uniform high-quality mixture, but also definite secondary features. The system is completely automatic, so that operators do not have to switch to manual control when stopping or starting the conveyors. Location of the additional Vesta flow recording and integrating instrument in the superintendent's office permits simplified supervision of the system.

Schematic diagram of trans-weigh instrumentation for the Vesta-Shannopin coal proportioning system



MINING MISCELLANY

Drilling operations to locate uranium bearing rocks in the Tiruchengode area and Suryamalai hills in the Salem district in Madras State will be undertaken shortly. Investigations carried out so far indicate that drilling will be justified and, therefore, it is proposed to start drilling operations shortly.

★

The Government of India is holding experiments in Jamshodpur on a small-scale pilot steel plant by using low-grade coal in the production of steel. If the experiments succeed there are possibilities of small steel plants using low-grade coal being included in the third Five-Year Plan, says Mr. K. C. Reddy, Minister for Works, Housing and Supply, Government of India. He added that Neiveli, in Madras State, might even become the site of a steel plant when briquetting of lignite found there yielded the expected results.

★

The Canadian Prime Minister has announced a special $4,300,000 programme of transportation subsidies aimed at placing some 700,000 tons of the surplus coal piling up in Nova Scotia on to the Ontario market. For some time now Nova Scotia has been overproducing: a situation created largely by massive imports of fuel from the United States and a swing towards alternative fuel. The subsidies will also affect freight rates for coal delivered unto the established market areas in Quebec. The Nova Scotia Provincial Government is to contribute $500,000 towards the total aid and the balance will be paid by the Canadian Government. In consequence of this financial help, the Dominion Coal Co. has intimated that no further lay-offs will be made at any of the mines it operates beyond the 40 days already announced.

★

A new edition of the British Standard dealing with H-section steel arches has just been published. This is a comprehensive revision of B.S. 227 and results from co-operative effort by manufacturers and N.C.B. representatives to provide a useful basic specification. The standard shapes of arches are the "straight-legged" and "splay-legged" types, the earlier "horse-shoe" having been deleted. Two-piece and three-piece designs are specified, and jointing is by four-hole fishplates throughout. The fishplates are channel shaped as compared with the flat design of the previous edition and are radiused to the shape of the arch. An additional steel has been included, of grade 35-43 tons per sq. in., for both sections and fishplates, and the range of joists has been extended to show several H-sections and splayed H-sections specially developed for use as roadway supports.

★

Total production of sulphur in Mexico for 1958 reached the record figure of 1,276,953 tons, of which 1,087,576 tons were exported. Production in January fell slightly to 105,266 tons compared with 115,322 tons in December. Exports also fell slightly from 108,015 tons in December to 64,877 tons in January—local sales fell, too, from 8,000 tons in December to 6,984 tons in January.

★

The Dutch Metal Industries' Association has announced that the exports of the industry in 1958 reached a record figure of 2,325,000,000 fl., 15 per cent more than in 1957 and equivalent to 19 per cent of total national exports. Of the exports, 35 per cent were to the countries of the Common Market.

★

During 1958 production of iron ore in Venezuela was 15,400,000 tonnes, an increase of 146,776 tons over 1957.

★

Engineers from the Mining Research Institute in Turkey have established the presence of a reserve of 4,000,000 tons of pyrites containing copper around Tirebolu (near Giresun). Further research work is being carried out.

★

At Las Adjuntas, 30 km. north of Monclova, the home of Mexico's largest steel plant, 500,000,000 tons of coal have been discovered. If subsequent investigation confirms these deposits, they will be of immense advantage to the steel industry.

★

The Research and Development Division of Baird and Tatlock (London) Ltd. has recently been doubled in size to keep pace with the increasing demand both for "Analmatic" equipment for automation in analysis and for new and redesigned standard laboratory instruments and apparatus.

★

The El Salvador copper ore deposit of the Andes Copper Mining Company, a subsidiary of the Anaconda Company, with a production potential of 100,000 tonnes per annum, will be inaugurated in November next.

★

Mining experts from nine countries have met in Essen, Germany, for the founding of an International Committee for Mining Standards. Represented were Britain, the United States, the Netherlands, Belgium, France, East and West Germany, Poland and Sweden. The committee is to discuss the co-ordination of safety standards, mining maps and surveys, and other matters on an international level.

★

Measures to assist the West German lead and zinc mining industries are now under consideration by the Federal Ministry of Economics in Germany. Two mining companies are believed to have asked for financial assistance totalling 16,000,000 marks to tide them over current difficulties. Some quarters have suggested tax reliefs as one way of helping the two industries, but no final decision has been made so far. Present difficulties are attributed to falling prices and the end of United States stockpile buying. In the past two years eight mines have closed down. Lead production declined 14 per cent last year to 61,000 tons, while zinc production fell 9 per cent to 85,000 tons.

PERSONAL

Sir Jock Campbell has been appointed to the board of Williamson Diamonds Ltd. with Mr. John L. Leyden C.B.E., as his alternate.

★

The National Coal Board have appointed Dr. J. Bronowski as director-general of a new department to take charge of the development of new processes for treating coal, and in particular of the development of new processes for making smokeless briquettes from small coal. The department will be called the Process Development Department.

★

Mr. T. A. Stone has been appointed special assistant to Mr. H. S. Wingate, president of the International Nickel Co. of Canada Ltd. Mr. Stone was Canadian ambassador to the Netherlands from 1952 until the end of last year.

★

At the annual general meeting of the London Chamber of Commerce on May 5, the Rt. Hon. Lord Ebbisham, T.D., was re-elected president.

★

Mr. W. P. Warren, B.Sc., M.I.E.E., formerly commercial manager of the Industrial Group of the United Kingdom Atomic Energy Authority, has joined the Powell Duffryn Group of Companies as sales director of their subsidiary company, Cambrian Wagon and Engineering Co. Ltd., at Cardiff.

COMPANY NEWS

The new Kelvin House was officially opened by Sir David Eccles, President of the Board of Trade, on Monday of this week.

★

Dowty Mining Equipment Ltd. is the only British company exhibiting at the Cleveland, Ohio, Coal Show, held from May 11 to 14.

CONTRACTS AND TENDERS

India

Submersible/borehole pump sets and pump control units. Manufacture, testing before shipment, and delivery at site of 41 submersible or borehole pumps. Issuing authority and tender number, Neyveli Lignite Corporation (Private) Ltd., 1141B/H II (10)-30. Address to which bids should be sent, the Deputy General Manager (Technical), Neyveli Lignite Corporation (Private) Ltd., Neyveli, South Arcot District, Madras State. Closing date, June 1, 1959. Ref. ESB/10523/59. Telephone inquiries to Chancery 4411, extension 738 or 771.

Taiwan (Formosa)

Rock drill bits, 1¼ in. (5,000), 1½ in. (6,000), and 1⅝ in. (9,000). Closing date, May 21, 1959. Bids to issuing authority at Central Trust of China, Purchasing Department, 68 Yen Ping Nan Road, Taipei, Taiwan (Formosa). Ref. ESB/11014/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

Machinery and Equipment

Skip Winding Plant

Head Wrightson Stockton Forge Ltd., a subsidiary of Head Wrightson and Co. Ltd., supplied the surface and underground equipment for the Rufford Colliery reorganization, designed to deal with 520 tons per hour of run-of-mine coal, using mine cars of 4 tons capacity and bottom discharge skips with a capacity of 12 tons each, together with the Koepe winder towers. The guide tower and air casing are of steel construction, and are provided with internal platforms and air-lock access doors. The bottom discharge skips incorporate an anti-breakage device fitted with a guillotine-type bottom discharge door which is pneumatically operated when the skip reaches the discharge position. Men and material can be carried by the skips, each of which is approximately 4 ft. 4 in. wide by 13 ft. by 32 ft. long.

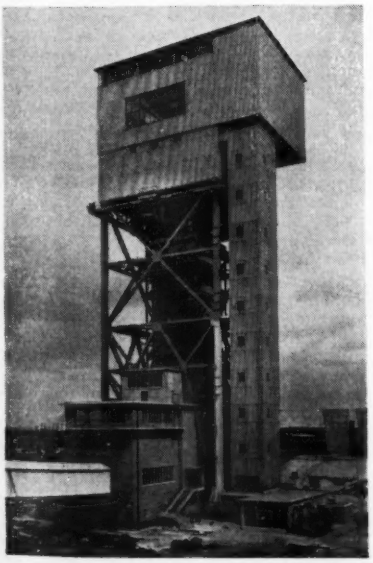
The receiving hopper has a capacity of approximately 36 tons, and it is totally enclosed and provided with pneumatically operated doors at the top and bottom, interlocked to form an airlock for the passage of coal from the upcast shaft to atmosphere. The 54 in. wide apron feeder, with an articulated steel apron carried on 6 in. pitch roller chains operating on driving and trailing sprockets, has apron chains carried on the top by steel channel tracks and on the underside by cast-iron rollers spaced at intervals. The material is retained on the apron by steel skirts and the drive is from a 10 h.p. 720 r.p.m. electric motor through a reduction gearbox and a chain drive to the headshaft. The speed of the apron plate is approximately 50 ft. per minute.

Men and materials winding is carried out from the shaft collar level and hand-operated hinged platforms and sliding gates are provided. Skip changing is also done from this level, and to facilitate these operations a crawl beam and special skip bogie are provided in the Heapstead building.

The multi-rope suspension gears are of the four-strand type, and each strand has a minimum factor of safety of 10 in relation to the maximum static load of 12.5 tons per rope end; 50 tons per four ropes. Each strand incorporates a load capsule and gauge so that loads on each rope can be checked. Individual components have been proof-tested to not less than 2.5 times their proportion of static load. The balance rope suspension gear is of the swivel type, and there are two ropes attached to the underside of each skip.

The compressed air for the whole of the skip surface pneumatic equipment is obtained from two twin-cylinder, two-stage, self-contained water-cooled compressors (supplied by Holma Ltd.) to drive 75 h.p. Each runs at a speed of 475 r.p.m. with a piston displacement of 404 cu. ft. per minute and an actual free air delivery of 358 cu. ft. per minute at a pressure of 100 lb. per sq. in. b.h.p. Qualter Hall Ltd. supplied the skips and skip-door operating equipment for this project.

Koepe winder tower in final stages of construction at Rufford Colliery



PORTABLE SCREENING

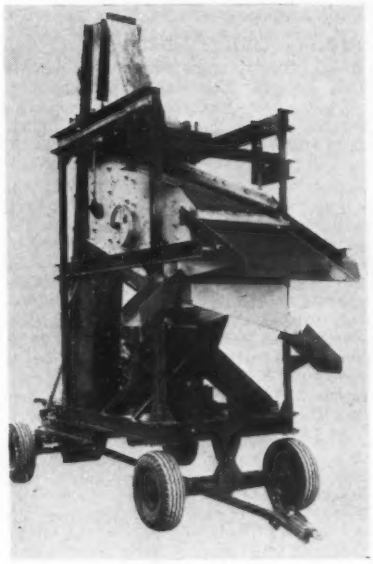
It is frequently uneconomical to pass certain materials through existing plant due to time and costs incurred in transportation from workings not easily accessible, or alternatively a considerable distance away. The Moxey portable screening plant, designed for the efficient handling of sand, gravel, shale, coal, and ash, etc., would be the answer to this problem.

Material may be delivered by hand, excavator, or grab, into the feed hopper; it is lifted by bucket elevator and fed on to the full width of the screen. Oversize is rejected by chute, whilst graded materials may be loaded by further chutes to vehicles. This plant is powered by an air-cooled diesel engine and is capable of continuous operation over long periods. Maximum screening efficiency is given by the Moxey-Dillon full-floating, circle-throw, vibrating screen, which because of its design and suspension transmits no vibration to supporting structure or chassis.

THE AUTOMATIC QUARRY

Speaking at Leamington recently, Mr. L. Landon Goodman, Electrical Development Association, pointed out to members of the Institute of Quarrying that the advent of automation in the quarrying industry may be nearer than is at present thought likely.

Although electronic heating was not used at present to any extent in the quarrying industry, he said, nevertheless an important application might arise at some future date. Automatic electronic control could be used in the feed to a crusher. In an electronically controlled installation, the current taken by the crusher drive was monitored and controlled the speed of the plate or other feeder. The method eliminated the need for timers or manual control and ensured that overloading could not take place.



The Moxey portable screening plant

Electronic techniques played an important part in instrumentation. Continuous measurement could now be made of several physical quantities—as well as temperature, pressure, level, weight, flow, and volume — including viscosity, conductivity, pH, liquid density refractive index, specific gravity, and chemical composition.

To take full advantage of the benefits that these new techniques such as electronics and automation could give, it was necessary to make an overall appraisal of the whole method of working. Usually, the best results were not obtained by considering separately the designs of control and instrumentation equipment and of the process and auxiliary plant. Experience taught that they should be designed as one integral unit. A modification, or indeed often a radical change, in processing methods was sometimes necessary in order that automation could be applied.

RANGE OF PROPS

In order that the nomenclature relating to the Dobson Mark V 25-ton yield prop range more nearly corresponds to the closed height of the prop, it has been decided to alter the models previously known as 5280, 3250, and 2232, as follows: model 5280 to become model 5380; model 3250 to become model 3450; model 2232 to become model 2332. This does not alter the actual size of the Mark V props.

Since the majority of the model 2332 props supplied have had a 6 in. or greater extension fitted, it has been decided to introduce a new model to be known as the 2942 into the range. This will have an extended height of 42 in. with about 13 in. of hydraulic travel; the maximum detachable top extension recommended is 9 in. Thus the maximum extended height of this model with a 9 in. extension is 4 ft. 3 in.

Metals and Minerals

Commercial Problems of Canada's Uranium Producers

Last year uranium became Canada's leading metal, when the value of the year's output (estimated at 13,500 l.tons of U_3O_8) was valued at $290,228,356. In the first quarter of the current year producer deliveries of Canadian uranium to the Crown company, Eldorado Mining and Refining, amounted to 3,881 tons valued at about $79,000,000, being one-third higher than the 2,488 tons worth $50,475,000 delivered in the first quarter of 1958.

The market outlook for uranium is thus a matter of critical concern not only to Canadian producers but to the prosperity of the Dominion itself. Rio Tinto are at present producing over 15 per cent of the Free World's output of uranium, the greater part of it from their Canadian mines. It is hardly surprising, therefore, that in his annual statement the chairman, Mr. Gerald Coke, should have devoted considerable attention to the commercial problems of the Canadian industry. His analysis of the supply-demand picture is that a surplus of uranium seems probable in the years immediately ahead, but that by about 1970 demand will have overtaken the accumulated excess of supply, after which—depending on a number of imponderables—there may be a shortage of the metal in the Free World.

Although the expansion of production which has taken place in the U.S. has probably been no more than sufficient to take care of the increased requirements of that country, the present position is that more uranium is produced than is currently required for consumption. It is largely for this reason that no fresh government contracts have been, or will be, placed for some years to come on the basis of amortizing the full cost of the mine over the life of the contract.

On the commercial side Rio Tinto have been active. Valuable contacts have been established with agencies responsible for nuclear power programmes. The company believes that the Rio Tinto mines can produce an oxide which will be competitive within the Free World and that the commercial side of its organization can compete fully with the civilian requirements of uranium in any country.

Unfortunately, the development of commercial markets does not lie solely in the company's hands, and in this connection Mr. Coke draws attention to the dilemma with which the Canadian uranium producers are presented. For reasons of security, sales of uranium within the Free World during the past few years have been circumscribed by internationally agreed regulations. These regulations have necessitated bilateral agreements between the exporting country and the receiver before the sale can take place. These bilateral agreements are still obligatory in the case of exports from Canada and the U.S., but are not being observed by some other countries.

The U.S. has not only entered into bilateral agreements with all likely customers but has also protected its domestic producers by granting contracts through to 1966, whereas no such security exists in the case of the Canadian producers beyond 1962 or 1963, since there is no assurance that the U.S. will exercise the options they hold on the Canadian production beyond that date. Indeed, current indications in Washington are that there is no intention at present of doing so. The U.S. Government, in fact, appears to be lacking in a realistic appreciation of the importance of uranium to Canada's economy, and in particular to the large new communities that have sprung up at Elliot Lake and other centres of the industry.

The Canadian producers are thus without the security granted to the American producers; nor are they free to compete with countries which sell without bilateral agreements. Unfortunately, the Canadian Government appears to have been dilatory in concluding bilateral agreements with other countries for the sale of uranium oxide. Apart from the U.S. and the U.K., Canadian bilateral agreements exist only with Germany and are about to be concluded with Japan and, it is believed, India, although in the latter case only for technical assistance. It follows that Canadian uranium producers are limited in regard to the countries in which they can attempt to negotiate sales, and in this respect they are at a disadvantage as compared with other countries which have a wider range of bilateral agreements. It would, therefore, seem to be a matter of urgency for Canadian producers that the Canadian Government should appreciate this difficulty.

Although the tonnages of uranium being sold outside the large premium contracts are at present extremely small, there is an obvious danger that, unless some early and positive action is taken by the Canadian Government, consumers in the Free World might become accustomed to purchasing uranium oxide from suppliers other than Canada.

There seems to be no danger of existing Canadian producers' contracts for supplying the U.S. being abrogated, and at present the tonnage of uranium being sold outside the large premium contracts is extremely small. Nevertheless, outside markets are already becoming established, and the volume of commercial dealings may well have reached impressive dimensions by the time that existing contracts expire. Moreover, Canadian producers could produce tonnages substantially in excess of their contracts during the remainder of the contract period, provided they could find markets for them.

So, too, could Rio Tinto's Australian property, Mary Kathleen Mine, whose contract position is less worrying, since the Australian company's contract with the U.K. Atomic Energy Authority does not run out till 1965.

QUICKSILVER PRICE FALLS

The London ex-warehouse quicksilver price is now quoted at £78 per flask, being a fall of £1. This is the first reduction since the price started to rise from £74 some two months ago. It caused little surprise, since the undertone of the market had been looking none too assured, and demand is said to be still quiet. Some quicksilver is expected to be arriving shortly, while it is understood that offers of Mexican material have been made down to about £75 c.i.f. Some Yugoslav quicksilver is available at £76 c.i.f.

It has now to be seen whether Italy, who has recently adopted a more flexible selling policy, will take the lower London price as a basis for future business. Spain's attitude to current market conditions seems obscure, but it is possible that she might become rather more competitive. For months past, Spain has been quoting a base price of £80 per flask, f.o.b., with varying discounts for quality lots.

WOLFRAM MOVES HIGHER

On April 30 the wolfram ore shipment price in London was raised 3s. to 87s. - 92s. per l.ton unit c.i.f. Europe for minimum 65 per cent material. This was the first move since the beginning of February, prior to which the price had been slipping steadily from around 97s. 6d. at the beginning of January.

The upturn in price has been extended this week. Dealers now indicate minimum 65 per cent material at 89s. - 94s. A certain amount of business has matured within the current range, while the tone of the market has been looking better since the reduction of European stocks following the recent U.S. buying and the big Belgian purchase. Moreover, with ore prices firming, rather more demand from the ferrotungsten makers has been noted.

NICKEL-CADMIUM BATTERIES

An interesting example of the nickel industry's progress in the development of new markets is a report that sintered plate, nickel-cadmium batteries for starting diesel engines in mechanical refrigerator cars promise to give over ten years more service than lead-acid batteries, as indicated by recent tests made by the Pacific Fruit Express Co. As a result, they are replacing conventional lead-acid batteries which had previously been used for this application.

Most of the new batteries have also demonstrated far better performance at low temperatures. During cold weather, lead-acid batteries did not retain sufficient engine-starting strength, and it was also the company's experience that, in extremely cold atmospheres, the battery casings often became brittle, and the electrolyte froze. Since battery failure can be very expensive, the company sought a reliable sure-starting battery. The sintered-plate, nickel-cadmium battery, widely used in commercial and military jet planes, proved to have not only the necessary reliability but also longer

life. Another advantage of the new battery is its comparatively small size and weight. The 12-volt battery used in the American company's refrigerator cars has a 60-ampere-hour capacity and weighs only 62 lb. The 12-volt lead-acid battery it is replacing weighs over 100 lb.

FRANCE'S SILVER PURCHASES

France every few days is said to be buying substantial tonnages of "free" foreign silver in the United States for the French coinage system. The French purchases started early in March and are expected to continue into 1961.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The week under review has been one in which prices in the copper market have declined although the undertone has remained steady, whilst for the other three metals there has been an advance in quotations based on substantial support.

COPPER EASES FURTHER

Business in the copper market has been on a much reduced scale and price movements have tended in a downward direction. In the U.K. and Europe there has been little demand outside long-term contracts, whilst in America consumers are no longer willing to pay a large premium over the producers' price of 31½ c. per lb. for their requirements. In view of this, the customs smelter quotation has been lowered to 32 c. per lb., and at this level it is reported that sufficient sales can be made to balance the intake of copper scrap, the basis price for which has been reduced to 26 c. per lb. The Belgian price has been reduced also in conformity with the U.S. and London quotations and now stands at the equivalent of approximately 29½ c. per lb. New York or Antwerp.

The stocks in official Metal Exchange warehouses showed a further rise of 425 tons, giving a total of 10,741 tons. This has further established the existing contango. Figures have become available for the production of copper by the Rhodesian Selection Trust Group of Companies for the first quarter of 1959, and these show that for the nine months ending March, 1959, Roan Antelope produced 55,274 s.tons as compared with 60,215 s.tons for the nine months ending March, 1958; the figures for Mufulira Copper Mines are 61,375 tons as compared with 69,396 tons, and for Chibuluma Mines 12,883 tons against 21,940 tons. The production figures for the nine months ending March, 1959, are, of course, affected by the voluntary cutback instituted early in the year and also the strike in Rhodesia which lasted from the middle of September until early November, 1958.

Copper production from the main American operations in Chile during the first four months of this year totalled 160,355 tonnes compared with 124,322 tonnes in the corresponding period of 1958.

BUFFER STOCK SELLING

The tin market has remained steady in spite of good demand, and this seems to indicate that the buffer stock manager is taking the present opportunity of disposing of some of his stock. Stocks in official warehouses were again lower by 218 tons at 8,515 tons. Figures from Malaya show that shipments during the month of April from Singapore totalled 25¼ tons whilst those from Penang totalled 2,535¼ tons.

According to the Bureau of Mines, domestic consumption in the United States remained virtually unchanged in February, thus giving an increase in the daily average rate of usage. The metal used during the month totalled 6,785 l.tons as compared with 6,860 l.tons for January and stocks during the same period showed a very slight increase. On Thursday the Eastern price was equivalent to £811¼ per ton c.i.f. Europe.

MORE LEAD-ZINC CUTBACKS

The lead and zinc markets have been dominated by speculation on the outcome of the meeting now being held in New York, and from the movement in prices it appears that the majority view is that some sort of agreement will be reached whereby either production or export or both will be controlled. In the meantime, consumption of both metals shows some signs of improving and it may be that, whatever the outcome of the meeting, prices will remain at around their present level.

After announcements of the curtailment in production of zinc reported last week, it has been announced that Katanga have decided to cut exports of zinc metal by 5,000 tons a year from June 1. Also the American Lead Zinc and Smelting Co. has announced its intention to reduce output of slab zinc by 5 per cent with effect from July 1; this cutback amounts to about 6,000 tons per annum.

The Bureau of Mines reported the consumption of slab zinc during February at 75,900 s.tons. This is approximately 3 per cent below the January figure but owing to the shorter month the daily rate of use was slightly higher. Production from domestic mines in February totalled 36,400 s.tons, a slight increase over January in spite of the shorter month.

The production of lead in O.E.E.C. countries during March totalled 47,181 tonnes against 46,396 tonnes in February, whilst production of zinc reached 75,297 tonnes against 64,071 tonnes in February. It is interesting to note that when compared with last year lead production fell, showing a decrease of some 8 per cent, while zinc figures show an increase of about 5 per cent.

Closing prices are as follows:

	April 30		May 7	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£234½	£234¾	£233¾	£234
Three months	£235¼	£235¾	£235¼	£235½
Settlement	£234¾		£234	
Week's turnover	11,925 tons		8,175 tons	
LEAD				
Current ½ month	£69⅜	£69½	£70⅛	£70¼
Three months	£70¼	£70⅜	£71⅛	£71¼
Week's turnover	9,625 tons		7,200 tons	
TIN				
Cash	£783½	£784	£783½	£784
Three months	£784	£784½	£784½	£785
Settlement	£784		£784	
Week's turnover	930 tons		895 tons	
ZINC				
Current ½ month	£74½	£74¾	£75½	£76
Three months	£73¾	£73¾	£74¼	£74¾
Week's turnover	8,650 tons		7,575 tons	

LONDON METAL AND ORE PRICES, MAY 7, 1959

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 0d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 14s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram.
Gold, 249s. 4½d.
Iridium, £23/£25 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £245/£250
Magnesium, 2s. 3d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £21/£23 oz. nom.
Osmiridium, nom.
Palladium, £6 10s./£7 10s.
Platinum U.K. and Empire Refined £28 10s oz
Imported £25/£26
Quicksilver, £78 ex-warehouse
Rhodium, £41/£45 oz.
Ruthenium, £18/£20 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 79¼d. f. oz. spot and 78⅛d. f'd
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth		30% 5s. 0d. lb. c.i.f. 20% 3s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3 : 1)	£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%		£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3 : 1)	£14 0s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade		nom.
Fluorspar—		
Acid Grade, Flotated Material		£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)		156s. 0d. ex works
Lithium Ore—		
Petalite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46% - 48%) basis 57s. 6d. freight		nom.
Manganese Ore (43% - 45%)		nom.
Manganese Ore (38% - 40%)		nom.
Molybdenite (85%) basis		8s. 11d. per lb. (f.o.b.)
Titanium Ore—		
Rutile 95/97% TiO_2 (prompt delivery)		£31/£33 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2		£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)		89s. 0d./94s. 0d. per unit c.i.f.
Vanadium—		
Fuse d oxide 95% V_2O_5		8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65 - 66% ZrO_2)		£17 0s. ton c.i.f.

Mining Finance

Tinto's Big Retentions

In his statement to shareholders of Rio Tinto, Mr. Gerald Coke, the chairman, draws an interesting and comprehensive picture of future demand-supply trends for uranium. This is fully discussed on page 502.

So detailed was the preliminary profits statement issued by Rio Tinto and discussed on page 423 of our issue of April 17, that there was little additional information to be looked for in the full accounts. Some light has, however, now been thrown on the larger profits which have been retained by the subsidiaries in a year in which the group's profits have contracted.

Almost the whole of the difference between the £444,000 for 1957 and the £559,000 for 1958 relates to Australia. This arises from the decision, made in 1957, to adopt a new policy regarding exploration expenditure. Individual abortive projects, although in the same territory as live projects, are now being written off; £544,000 was used in 1958 to implement that decision.

There is also an echo in the accounts of the sale of the Spanish assets: the tax liability on that transaction has been fixed at £697,000, the fifth instalment of the cash purchase price has been received, and only £200,000 remains to be paid, over the next two years.

The note to the balance sheet shows a sharp drop in commitments and contingencies, but against that the current assets have fallen from £12,805,000 to £9,445,000, and at the same time, current liabilities have grown from £4,321,000 to £5,453,000.

There are no indications that the board is perturbed by this change in liquidity. Indeed, this state might well be more appropriate for the company now that capital commitments are mainly out of the way. If the group needs more liquid resources in the future, it would probably be the consequence of success by the exploration teams, which, of course, would not be unwelcome.

An example of this group's never-ending search for new interests was given by the publication, just in advance of the annual report, of proposals for large-scale exploitation of the Zawar lead-zinc deposits in Rajastan, India.

The present intention is that Rio Tinto will subscribe for 40 per cent of the equity of the Metal Corporation of India at a cost of £450,000. Indian Steel and Wire Products will subscribe a similar amount. The Metals Corporation is currently working the Zawar deposits on a small scale and the present shareholders will retain a one-fifth interest in the company. Loan funds will be made available in accordance with arrangemets with the Indian Government. The proposals are subject to the agreement of the Metal Corporation's present shareholders.

India is at present a substantial importer of lead and zinc. Metal from Zawar is, therefore, assured of a ready local market, and it may not be over-optimistic for Rio Tinto to hope that eventually the Metal Corporation will be able to fill the larger part of India's requirements.

LONDON MARKET HIGHLIGHTS

South African gold shares started the week in fine fettle. Over the week-end, the increasing United States gold loss had again attracted considerable publicity, and this, of course, revived gold price hopes. Consequently, the older dividend-paying mines soon figured on brokers' lists of buying orders, especially Crown (24s. 3d.) and East Geduld (26s.). The newer mines were additionally boosted by hopes—later confirmed—of a fresh crop of record profits in the April returns. To complete the picture, finance house issues responded well to a continued investment support.

Some of the steam went out of the advance on Tuesday, when a certain amount of Cape profit-taking developed. But by Wednesday afternoon the Kaffir market had regained all of its earlier strength, and a fresh list of price gains was established.

After touching 72s. when the record April profits were announced, President Brand fell back to 71s. on profit-taking before moving ahead again. Welkom spurted to 22s. 9d. following a strong Cape demand, inspired by hopes of good development progress in the richer south-west corner of the property. Johannesburg buying was again seen in Vaal Reefs (41s.), while the new profit peaks were the main factors behind buying of Harmony (41s.) and Buffels (47s. 6d.). The imaginative proposals to exploit East Rand Proprietary down to depths of 12,000 ft. or more, as recapitulated in the annual report, were mirrored by a rise in the shares to 44s. 6d.

Confirmation that Union Corporation is to apply for two more mine leases shortly in the Kinross area (a third is under consideration) gave the shares at 59s. 6d. an extra fillip. Henderson's moved up to 12s. 4½d. in recognition of their interests in the Kinross district, which could mean a participation in any new mine formed there. "Freddies" (11s. 3d.) also attracted a speculative following by virtue of the drilling operations being carried out in the area lying south of the Vaal rives.

Even Freddies Consolidated hardened slightly, despite the news that unless the gold price is raised the company is unlikely ever to reach the dividend-paying stage. At 2s. 7½d., the shares are probably a reasonable gamble for those who feel that a higher gold price is near. After all, the mine is a comparatively new one, and it has 35,000,000 to 40,000,000 tons of marginal gold ore which can keep the present plant operating at full capacity for thirty to forty years.

Odd man out in the general gold share market revival was Free State Geduld. This was interpreted as being largely a result of switching into other O.F.S. shares, particularly those of Western Holdings (148s. 9d.), which, some feel, may still be lagging too far behind F.S.G.

The base-metal sections were firm enough for the most part. A steady rise took place in tins. It was based on both London and Singapore buying, and Southern Malayan (14s. 7½d.) and Sungei Besi (19s. 6d.) seemed to be particularly in demand. Apart from some sharp fluctuations in the Messina issues, copper shares held fairly steady. The recovery in R.S.T. group profits last quarter was much in line with expectations.

The New Broken Hill final dividend, on the other hand, was considerably better than many had anticipated in the light of the low level of lead-zinc prices. The shares improved to 35s., and this was a helpful influence on other stocks in the section. Mount Isa (36s.) were additionally helped by their increased interim.

Consolidated Zinc moved ahead with the rest, but at 62s. 6d. showed some signs of nervousness in front of the preliminary profits statement. The fears proved to be groundless, for the statement turned out to contain no shocks. Indeed, earnings were surprisingly well maintained. The final dividend of 2s., making 3s., was as forecast by the chairman at the time of the new issue in March.

UNION CORPORATION SALTS IT AWAY

About this time last year Union Corporation announced that it had placed privately a note issue of some £2,000,000 with the object of building up the company's finances for new business. This was taken to mean the exploitation of the Kinross goldfield, and this year's balance sheet confirms the impression.

On the asset side of the balance sheet it is immediately noticeable that the item of debtors and cash assets has risen by £1,367,000, largely in the form of increased short-term, and, therefore, low-yielding deposits. It would appear, therefore, that in March last year the Corporation was prepared to pay perhaps 3 per cent for the privilege of holding cash in readiness to float new Kinross mines when the time was ripe. In retrospect, of course, the Corporation may now regret having made this decision, but in the light of the improved market conditions which then existed, and of the various short-lived boomlets which had been a feature of the previous year, the course taken was probably justified.

Another feature of the Union Corporation balance sheet is the continued growth in the value of the portfolio. At the end of the year the valuation was £22,588,000 against £17,721,000, and it is certain that the improvement has continued into the current year. At the year-end the portfolio value was equal to about 52s. 6d. per share, and the share price was 49s. 6d. Since then, the price of a Union Corporation share has risen to 59s. 6d., but even at this level the portfolio is probably at a discount. In any case, the £8,806,723 of fixed assets, the sundry participations of about £1,135,355 and the net current assets of almost £2,000,000 are apparently valued in the market at nothing.

R.S.T. COPPER QUARTERLIES

The reports issued by the Rhodesian Selection Trust group of companies for the March, 1959, quarter, contain two encouraging features. First, the cost of production (a term which includes administration expenditure, estimated provision for replacements and interest payable) has dropped back to more normal proportions compared with the strike-bound December quarter. Second, Chibuluma Mines has recommenced the sale of cobalt, making a profit of £23,000. This sum is calculated by the new method introduced last year whereby much of the costs are carried by copper.

Two points need making about the level of costs of copper production. Costs of production in the September, 1958, quarter were affected by the beginning of the strike which overlapped the last two weeks of that quarter and continued until November 4. To the extent that costs in that period were raised by the strike, the latest results could be considered disappointing. The reason for the comparatively high level of costs is that the average price received for copper was much higher in the March three months. Consequently, the copper bonus is higher, as is the royalty payable to "Chartered". An increase of £40 in the basic price taken for royalty calculations, which need not be the same as that shown by the companies as having been received, would increase the royalty by about £5 10s. per ton. The latest results cannot, therefore, be reckoned altogether unsatisfactory.

	Sales (tons)	*Profits* £	*Revenue** £	*Profits** £	*Costs** £
Chibuluma Mines:					
1958-59, Sept. qtr ...	4,091	117,000	194	29	165
Mar. qtr. ...	5,589	420,000	227	76	151
Mufulira:					
1958-59, Sept. qtr. ...	22,119	1,193,000	204	54	150
Mar. qtr. ...	22,593	2,002,000	239	87	152
Roan Antelope:					
1958-59, Sept. qtr. ...	19,419	813,000	191	42	149
Mar. qtr. ...	20,611	1,532,000	232	74	158

* per ton.

ANGLO-VAAL IN THE O.F.S. — VIRGINIA AND MERRIESPRUIT

The quarterly reports of Merriespruit (O.F.S.) have kept the public informed on the physical progress made in driving the de-watering haulageways from the neighbouring Virginia mine into Merriespruit. The vital question to which the 1958 accounts now provide the answer is the amount of financial resources at the immediate disposal of the company.

Although £348,853 was spent during the year mostly on development, the amount held in cash improved, but this is only the consequence of reducing debtors and payments in advance to £25,072 as compared with £529,258. With current assets of £795,846 against £1,087,672 at end-1957, the company appears to have enough funds available for the current year at least, but £250,000 will become payable to Virginia Land and Estate when the mine resumes normal gold production.

In the case of Virginia, the big problem is its heavy loan capital outstanding. Some progress was made in reducing this at the year-end. By last December, fixed loans were almost £700,000 lower at £12,362,765, still a weighty burden.

BRITISH ALUMINIUM SEEMS SHORT OF CASH

The statement by Sir Ivan Stedeford, on page 511, has clear implications for those shareholders of British Aluminium who did not accept the offer made earlier in the year by Tube Investments. He views the payment of a total ordinary dividend of 17½ per cent, 5½ points more than in the previous year, with disfavour. To pay a dividend at this rate, absorbing the whole of the year's available trading profits, is unjustified, in Sir Ivan's view. In future, "sound financial and dividend policy" based on ascertained results will dictate the rate, and Sir Ivan suggests that it is highly improbable that a dividend of 17½ per cent will be paid for the current period. "It is impossible", he says, "to forecast now when it might be justified". Sir Ivan discloses that the decision by the leading producers to cut the price of aluminium involved a stock loss of £201,000. He is clearly by no means convinced that this cut was a wise move.

On the future of aluminium, he was much more optimistic, while recognizing the difficulties. The greater availability would, he thought, permit of extending the uses of the metal.

The balance sheet shows that net current assets have fallen from £12,778,140 to £10,657,246, liquid resources forming a much smaller proportion of current assets than a year earlier. Presumably it is this position which Sir Ivan wants to correct. Indeed, with such developments as the Cape York project under way, a cash holding of £933,424 (against £2,726,654 a year earlier) is clearly somewhat low.

The I.M.M. Annual Dinner

The annual dinner of the Institution of Mining and Metallurgy was held at the Grocers' Hall, London, E.C.2, on Tuesday of this week, under the chairmanship of Mr. J. B. Dennison, president of the Institution.

The toast of the Institution was proposed by Mr. P. F. Barrett, Deputy High Commissioner for the Federation of Rhodesia and Nyasaland, and was responded to by the president.

The toast to the guests was proposed by the president-elect of the Institution, Dr. J. H. Watson, and was acknowledged by Mr. W. Dirkse-van-Schalkwyk, Minister for the Union of South Africa.

Guests of honour, in addition to Mr. Barrett and Mr. Dirkse-van-Schalkwyk, included: Sir Alan Brown, Deputy High Commissioner for Australia; Mr. W. Gibson-Smith, First Secretary (Commercial), Canada House. As well as: Mr. E. C. Baring, director of the Anglo American Corporation of South Africa; Sir Andrew Bryan, member of the National Coal Board; Mr. G. F. A. Burgess, joint managing director of British Metal Corporation; Mr. Frank Byers, director of the Rio Tinto Co. Ltd.; Mr. G. C. Lindesay Clark, president of the Australian Institute of Mining and Metallurgy; Mr. S. H. Clarke, director of Warren Spring Laboratory of the Department of Scientific and Industrial Research; Mr. A. V. Conrad, president of the British Overseas Mining Association; Mr. F. R. Cottell, chairman of Anglo-French Exploration Company; Mr. A. G. Davies, director of the Zinc Corporation; Mr. J. N. V. Duncan, managing director of the Rio Tinto Co. Ltd.; Mr. L. Farrer-Brown, of the Nuffield Foundation; Mr. A. N. Gilkes, high master of St. Paul's School; Sir Charles Hambro, chairman of Union Corporation; Mr. K. D. Harris, director of the Johannesburg Consolidated Investment Company; Mr. J. H. James, deputy master of the Royal Mint; Mr. H. J. Joel, chairman of the Johannesburg Consolidated Investment Company; Mr. G. M. Moerdyk, representative in London of the South African Department of Mines; Professor A. J. Murphy, president-elect of the Institution of Metallurgists; Mr. A. C. Owen, chairman of governors of the Camborne School of Metalliferous Mining; Sir Ronald Prain, president and chairman of Rhodesian Selection Trust; Mr. A. F. Radcliffe, president of the R.S.M. (Old Students) Association; Mr. Norman F. Railing, director of the General Mining and Finance Corporation; Mr. H. E. Reekie, headmaster of Felstead School; Mr. T. A. Rodgers, H.M. Chief Inspector of Mines and president of the Institution of Mining Engineers; Dr. S. W. Smith, past-president and honorary member of the Institution; Major General Sir E. L. Spears, chairman of Ashanti Gold Fields; Dr. C. J. Stubblefield, president of the Geological Society of London.

Coming Events

A four-day exhibition illustrating the properties and uses of nickel and its alloys is to be staged by Henry Wiggin and Co. Ltd., at Park Lane House, Park Lane, London, from May 12 to May 15. The exhibition, which will be called "Wiggin Nickel Alloys in Industry", will include displays featuring the various special properties of the Wiggin alloys (heat resistance, corrosion resistance, electrical resistance, and special physical properties). There will be over 350 examples of components, each using one or more of the alloys. The exhibition will be augmented by film shows and a series of lectures given by independent speakers from industry and government departments.

*

Mr. T. G. Hawker, B.Sc., A.M.I.E.E., is planning a new session of lectures entitled "Magnetic Power at Work". Electrical, mechanical, and allied societies who are interested should communicate with him, c/o Rapid Magnetic Machines Ltd., Lombard Street, Birmingham 12.

*

The British Institute of Management, London branch, announces that higher management lectures on Management Attitude and Approach are to be held at the Fyvie Hall, the Polytechnic, at 6.30 p.m. on the following dates: May 27, June 3, June 10, June 18, and June 24.

RIO TINTO

DIVERSE MINERAL INTERESTS

PROSPECTS OF URANIUM FOR PEACEFUL PURPOSES

The 86th Annual General Meeting of The Rio Tinto Company, Limited will be held on June 4 at Barrington House, 59, Gresham Street, London, E.C.2.

The following is the statement by the chairman, **Mr. Gerald Coke,** which has been circulated with the report and accounts for the year 1958.

Accounts

The form of the Accounts this year is the same as that adopted last year. For the reasons given in the Report, the Accounts of The Rio Tinto Mining Company of Canada are not consolidated, but separate statements give the results of that company for the year, and the diagram on pages 2 and 3 shows the percentage holdings of the Canadian Parent Company in its principal subsidiaries and associated operating companies.

Income

As has been emphasized in previous Statements, your Company's main source of income is still its holdings in the Rhodesian Copper Companies. The reduction in the dividends paid by these companies during the period under review is the reason for your Company's lower income and for the lower dividend. It is hoped that the increase in the price of copper which has taken place over the past months, will result in higher profits and dividends from the Copperbelt during the current year. The fall in income from the Rhodesian investments has only in part been made up by an increased dividend on your Company's holding in the Compañia Española de Minas de Rio Tinto, S.A. and certain tax savings which are referred to in the Report.

Special Interim Dividend

In order to effect a saving of some £25,000, advantage has been taken of the latitude given by the 1958 Finance Act to declare a part of the dividend in the form of an interim in respect of the current year. As is made clear in the Report of the Directors, this interim dividend will not be taken into account when the distribution for the current year comes to be considered.

Reserves

Agreement has been reached on the taxation arising out of the sale of the Spanish Assets, and this has enabled important adjustments to be made in the Reserves as shown on page 20 of the Accounts. It should be noted, however, that the sum of £544,000 has been written off in respect of abortive exploration expenditure and that £2,100,000 has been earmarked against Exploration and Development Expenditure which in future might prove abortive.

Provision has also been made in respect of depletion of the oil reserves of the Kern Oil Company acquired in 1957. The value attributed to these reserves at the time of acquisition was approximately £6¼ million. The annual provision to be made depends not only upon the extent to which the reserves have been depleted but also upon the estimated volume of new reserves discovered during the year. In respect of 1958 the directors consider that the sum of £250,000 should be charged against the profits for 1958 for this purpose. Unless further substantial oil reserves are proved in 1959, it is the Directors' intention to charge a similar amount against 1959 profits. To the 1958 charge has been added a further sum of £250,000 which has been released from the amount of £500,000 in the 1957 Accounts for Reserve against Investments in Subsidiary Companies, and it will be seen from the Report and Accounts that, as a result of these two transfers, the Kern oil reserves are now in the books at the reduced figure of approximately £6 million.

Furthermore, it is the Board's intention to finance future metal and oil exploration out of income and we shall, therefore, appropriate profits each year to form a reserve against any of this exploration which might in the future prove to be abortive.

Analysis of the Company's Interests

It may be of interest to Members to note from the diagram on page 21 of the Report that your Company's percentage interests in the various minerals are approximately as follows, based on the values ruling at the end of the year 1958:

Copper	30 per cent
Uranium:	
Equity	20 per cent
Loans, etc. ...	16 per cent
Oil	18 per cent
Other minerals ...	16 per cent
	100 per cent

Spain

In Spain your Company's continued interest in the original Rio Tinto Mines has brought an increased dividend during the course of the year. The world sulphur situation is, however, one of present over-supply and there is, therefore, a general trend of increased competition for markets. This has caused a reduction during the last few months in the export price received for pyrites. However, there should still be a reasonable margin between revenue and cost of production and the realistic commercial policy of remaining competitive with other sources of sulphur is to be commended. Our Spanish colleagues are continuing to maintain efficient working in the Mines and we are active in furthering the sales of the export pyrites.

For the happy relationship which exists between your Company and its Spanish associate we are especially indebted to the Conde de Benjumea, the Chairman of the Spanish Company, and to Señor de Torres Espinosa, the Managing Director.

Australia

Mary Kathleen

During the year the Mary Kathleen Mine came into full production. It was officially opened by the Prime Minister of Australia, the Rt. Hon. R. G. Menzies, on October 27, 1958, who said in concluding his speech on that occasion:

> "I have told you in a very imperfect way why it is that I'm here, why it is that I'm really enthusiastic about being here. I want to congratulate you and your colleagues, I want to congratulate all of you here to-night who have worked to make Mary Kathleen. I want to congratulate those of you who have taken charge of children, medical services, who are doing these necessary things in this community, and I want to express to you my complete confidence that the name of Mary Kathleen will shine in the developmental history of Australia, and that this will be a town that we can be proud of, with people in it of whom we will say—these are our best Australians."

Your Board would like to endorse what the Prime Minister said and to offer their own congratulations to those members of the Board of The Rio Tinto Mining Company of Australia who were primarily concerned with this enterprise, namely, Mr. Blake Pelly, Chairman, and Messrs. Rodd, Poole, Keast and Dickinson and to the fine team who worked with them.

The mine continues to make satisfactory progress and the only anxiety—surprising to anyone who lives in England—has been the lack of rain. Fortunately, however, when it appeared that drastic measures might have to be taken before long if the supplies in the dam were not to be exhausted before the next wet season, heaven wept on our enterprise and all is now well.

Exploration and Development

Rio Tinto are seeking to widen the base of their operations in Australia. The exploration programme which has been undertaken, in association in some cases with other mining enterprises, is one method by which we may hope to add further to our resources in this part of the world; but other opportunities of acquiring additional interests are under examination from time to time. It is the view of your Board that an expansion of our activity in Australia is justified by the forward-looking attitude to business adopted by all in that country from the Prime Minister downwards.

Canada

Seven of the Rio Tinto uranium mines in Canada are now in production and two of them—Pronto and Rix-Athabasca—have paid a maiden dividend. The Rio Tinto Mining Company of Canada is now producing more than 40 per cent. of the uranium oxide produced in Canada. I believe that this achievement reflects tremendous credit on the Canadian team headed by the President, the Hon. Robert Winters, and this notwithstanding the great difficulties experienced in a crash programme without precedent in mining.

Algom Uranium Mines Limited

Since the end of the year over 99 per cent. of the outstanding stock purchase warrants of Algom Uranium Mines were exercised and the funds accruing from the exercise of these warrants have enabled the company to repay all its outstanding funded debt.

Rio Tinto Dow

In his speech to the shareholders Mr. Winters reported that the thorium plant set up by Rio Tinto Dow is now in operation. The thorium produced by this plant is a by-product of uranium mining and should, therefore, be fully competitive in cost with that produced anywhere in the world. Though thorium

may at a later date have a commercial potential as a fissionable material, its present major use is confined to making alloys with other metals for more normal engineering purposes. Whether for nuclear or non-nuclear uses, however, Rio Tinto Dow will be in a position to supply a large part of any requirement likely to arise in the foreseeable future.

Uranium

Rio Tinto are at present producing over 15 per cent. of the free world's output of uranium. In May, 1956, some reference was made in the Chairman's Statement to the future of this commodity. Save for brief references in 1957 and 1958, the prospects for uranium have not been mentioned at any length and, in view of our substantial interest and of the conflicting opinions on the subject which are expressed, it may be appropriate if the forecasts made three years ago are brought up to date.

The conclusions reached in 1956 were that the demand for military purposes might be assessed at between 10,000 and 15,000 tons of uranium metal a year and that the civilian demand for the initial outfit of new reactors might require a further 10,000 tons a year by 1975. It would now appear that both these estimates were on the conservative side.

Military Requirements

The military demand must, of course, be affected by the outcome of the negotiations to limit the testing and use of nuclear weapons, and it is impossible to forecast what this will be. But it is believed that the present consumption of uranium for military purposes in the United States alone is not less than 20,000 tons a year. Moreover, this amount is likely to rise because it has recently been announced that the production of plutonium is to be increased. In fact, it has been stated in hearings before the Joint Committee on Atomic Energy that the estimated requirements of the United States after 1960 would be some 27,000 long tons or more.

The military requirements of the United Kingdom, although not comparable with those of the United States, must also be taken into account. The feed for the British enrichment plant is estimated to be about 1,000 tons of uranium a year, and to this must be added the requirements of the plutonium-producing reactors at Calder Hall, Chapelcross and elsewhere.

Another important aspect of the military use of uranium is the development of nuclear-propelled submarines and surface vessels. The voyages of the *U.S.S. Nautilus* and *U.S.S. Skate* under the polar icecap have underlined the possibilities of this method of powering ships, and the United States Navy have announced a programme for the construction of 75 nuclear-powered submarines by 1967, as well as plans for prototype surface ships. The Royal Navy's first nuclear-powered submarine is under development, while France and Italy have both announced similar projects. In the light of these developments the requirements for such nuclear-powered navies could be substantial in the late 1960s.

The present level of requirements of uranium for military purposes is now, therefore, above that estimated in 1956 and, unless complete nuclear disarmament were to become accepted policy, it could well increase.

Peaceful Requirements

The prospects for a greater civilian requirement for the metal are good. In 1956 it was estimated that there would be an annual increase in the free world's nuclear power capacity of 10,000 megawatts by 1975; this figure now looks modest. Although many of the nuclear power stations to be installed in the next five or six years may not be strictly competitive with conventional stations, their installation can be justified in others ways, for example by the need to save foreign currency or to lessen dependence on imported fuel. By about 1965, however, the experimental phase of nuclear power generation will have ended and thereafter the rate of installation is likely to be determined by purely economic considerations. The prospects for cost reductions are good, both through progressive refinements in design and by the introduction of more advanced reactor systems. Technically advanced countries which are net importers of power may expect to achieve cost parity in the near future. Sir John Cockcroft stated at the recent Geneva Conference that in certain areas in the United Kingdom nuclear power would achieve cost parity with coal-fired stations by 1962 and would be comparatively cheaper by the late 1960s. Even in the United States, with its abundant hydro-electric power and cheap coal, it is believed that cost parity could be achieved over substantial areas in the late 1960s. In general, cost parity should be achieved between 1963 and 1973, and the rate of installation of nuclear stations should increase in the late sixties and early seventies.

It was estimated three years ago that this programme would require about one ton of uranium per megawatt of capacity; since then various reactors have been designed offering greater output per ton of uranium than this. However, these are still at the experimental stage and discovery of further sources of supply has made it less necessary to conserve what was then thought to be a scarce metal and work on breeder reactors and other means of economizing its use has been slowed down. In the light of this re-assessment of the supply position the annual requirement for initial charges might be estimated at a figure of 15,000 tons a year by 1975 on the basis of an increase of capacity in megawatts of about the same figure. If to this is added the annual refuelling charges of about an equivalent tonnage, it would seem that there will be a total annual requirement of uranium for nuclear power purposes alone of 30,000 tons a year by about 1975.

It should not be forgotten that, in addition to the use of nuclear energy for the generation of power for general purposes, there are several possible industrial applications. The supply of heating or power for metallurgical and chemical processes and the use of small reactors to supply heat and power to localities in cold climates or isolated areas, where the expense of power transmission or fuel transportation would be extremely costly, may be instanced. In due course, moreover, economic propulsion units will be developed for use in merchant ships.

A start has been made in the United States with the laying of the keel of the *Savannah*, a nuclear-propelled freighter, and in several other countries nuclear-propelled tankers and freighters are on the drawing board.

Free-World Production

To meet these potential demands the output of the free world in 1958 was about 30,000 tons of uranium in concentrates. During 1959 the figure will increase to about 35,000 tons. There should thereafter be a small annual growth in output over the next few years, but unless additional sources are discovered and developed there will be a fall in output towards the end of the 1960s or even before that date if some producers are unable to weather the cold blast of fully competitive conditions. Although the expansion of production which has taken place in the United States has probably been no more than sufficient to take care of the increased requirements of that country, the present position is that more uranium is produced than is currently required for consumption. It is largely for this reason that no fresh government contracts have been or will be placed for some years to come on the basis of amortizing the full cost of the mine over the life of the contract. It would appear, however, that by about 1970 demand will have overtaken the accumulated excess of supply and thereafter—depending on a number of imponderables—there may be a shortage of the metal in the free world.

Commercial Aspects

On the commercial side Rio Tinto have been active during the year. Valuable contacts have been established with agencies responsible for nuclear power programmes, both in the Euratom group and outside it. We believe that the Rio Tinto mines can produce an oxide which will be competitive within the free world and that the commercial side of our organization can compete fully with the civilian requirements of uranium in any country, so that if the matter rested solely in our hands an optimistic view can be taken, both of the future of uranium as a fuel and of Rio Tinto's capacity to play their part as the largest producer in the British Commonwealth.

Unfortunately, it does not rest solely in our hands. Mr. Winters has pointed out in his speech to the shareholders some of the obstacles which have to be surmounted by the potential seller of uranium. It is not necessary to recapitulate here all the points which he made, but it should be emphasized that a dilemma faces the Canadian uranium producers. For reasons of security which are well appreciated by us, the sales of uranium within the free world have, during the last few years, been circumscribed by internationally agreed regulations. These regulations have necessitated bilateral political agreements between the exporting country and the receiver before the sale can take place. These bilateral agreements are still obligatory in the case of exports from Canada and the United States, but are not being observed by some other countries. The United States, however, have not only entered into bilateral agreements with all likely customers but have also protected their domestic producers by granting contracts through to 1966 whereas no such security exists in the case of the Canadian producers beyond 1962 or 1963 since the United States have given no indication as to whether they will exercise the options they hold on the Canadian production beyond those dates. This leaves the Canadian producers without the security granted to the American producers; nor are they free to compete with countries which sell without bilateral agreements,

Since the tonnages of uranium being sold outside the large premium contracts are at present extremely small, this might not appear to be a matter of importance, but unless some early and positive action is taken by the Canadian Government the consumers in the free world will become accustomed to purchasing uranium oxide from suppliers other than Canadian. This would be a serious matter for Canada, as uranium is one of their largest foreign exchange earners.

Africa

In the Chairman's statement last year it was pointed out that Rio Tinto's exploration activities in the African continent would be reduced in view of the less promising prospects for base metals. During the period under review, both in the Federation and in the Union, teams have been at work in the field. Exploration is a hard, and in the short term, frequently an unrewarding activity, but I am confident that our splendid team in Africa are making good progress and that in due course we shall not go unrewarded.

Oil and Gas

The Kern Oil organizations in California, the Rocky Mountains and Trinidad continue to make good progress. Interesting discoveries have been made in each area and this augurs well for the future. You will be interested to know that though our investment in Western Hemisphere oil new represents about 18 per cent. of our portfolio it is responsible for about 22 per cent. of our net income.

Pyrites Company Inc.

The operations of the Pyrites Company Inc. at Wilmington, Delaware, were affected by the general recession in business in the United States and it appeared at one time that certain parts of the works might have to close down altogether. It reflects great credit on the team who run this company, under the leadership of Mr. Elmer Heubeck, that they have been able to avert this possibility and find sufficient work to keep the plant busy. The reduced price of cobalt will affect the profits earned but this operation will still be able to make its contribution to our income and is, in proportion to its size, a useful dollar earner.

The Board

During the year Sir Eric Gore Browne has retired from the Board. He had been a Director for 11 years and his colleagues have always valued his wisdom and knowledge of affairs. His retirement from some business activities will be greatly to the benefit of the many charitable works to which he so generously devotes himself; we envy them their increased participation in his time, and we extend to him our gratitude for his help over the past years and our best wishes for his happiness and health in the future.

Sir Percivale Liesching has been appointed to the board. He has had a long and distinguished career in the public service and retired only recently from the post of United Kingdom High Commissioner in the Union of South Africa. His knowledge of all affairs, but especially of the British Commonwealth, makes him a valuable and distinguished colleague. We are fortunate indeed to have secured his services, which will add strength to the Board.

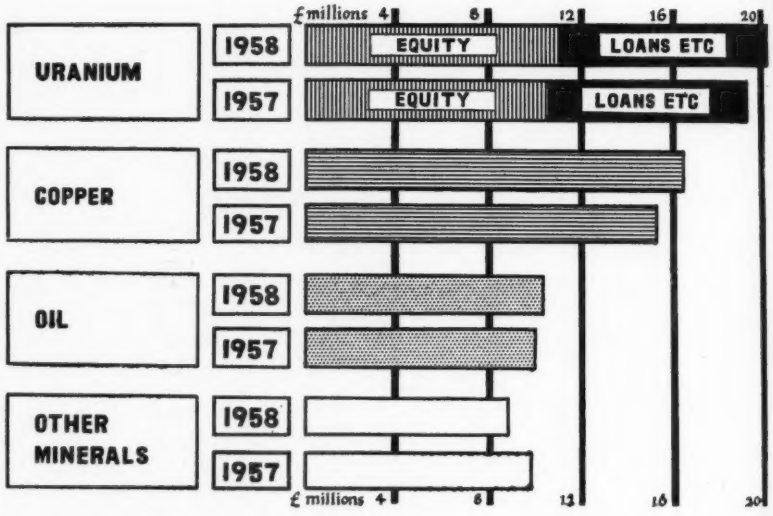
Mr. V. F. W. Cavendish-Bentinck has also joined the board since the last meeting. After serving in the diplomatic service in various posts, he became Chairman of the Joint Intelligence Committee during the war and afterwards took on the Chairmanship of the Committee of British Industrial Interests in Germany. He has since 1957 been associated with Rio Tinto as consultant on foreign affairs and will continue to give us the benefit of his advice and assistance on foreign relations generally and on foreign commercial matters in particular.

The part-time members of the Board have few opportunities to pay tribute to the work of their full-time colleagues; but the presentation of the Chairman's annual statement is one of the rare occasions when it is possible to remedy this omission. Mr. Saunders, Mr. Wright, and Mr. Byers each in his separate sphere has contributed more than a little to the success and harmony of the year's working. To single out for special mention their individual merits and contributions to the whole picture would be impossible within the scope of these paragraphs. But their colleagues hope that they will accept the gratitude and appreciation which their hard work has earned.

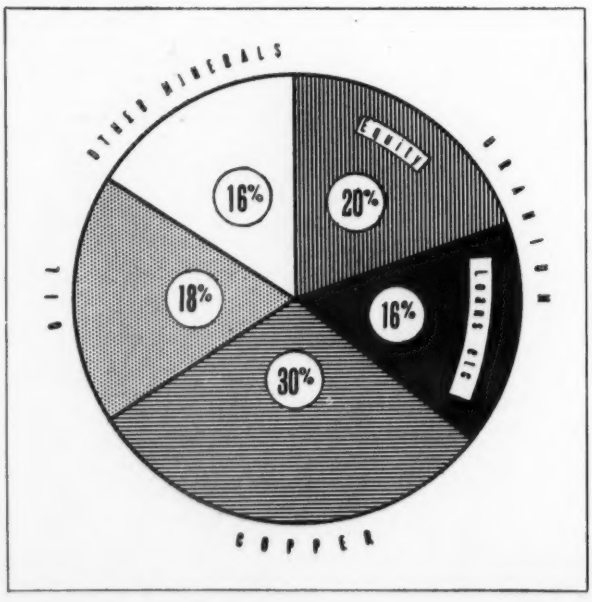
They would be the first to acknowledge that, without the leadership and inspiration of the Managing Director, Mr. Duncan, their work would go for nothing and all members of the Board would wish to join in thanking him once again for his outstanding work during the course of the year. His job is of formidable dimensions, involving as it does the general direction of policy and the supervision of business in four continents, together with the examination

The Company's Financial Interest in Minerals

These diagrams are based upon assets at book value or, where applicable, market value at the year-end.



Percentages of total; 1958



of the many other proposals which flow through his hands. But his devotion to every aspect of our affairs is the feature of his work which most impresses those who know him both within and outside Rio Tinto. For this devotion all associated with Rio Tinto owe him admiration and gratitude.

The Staff

During the year Mr. E. G. Lawford was killed in a motor accident. Mr. Lawford had only just retired from the post of Chief Technical Adviser to Rio Tinto and it had been hoped that his expert knowledge and advice would shortly have been available to the Board. His death has been a sad blow and was mourned by his friends and associates in many parts of the world.

The task of a Chairman in finding adequate words each year to express the Board's gratitude to the staff who so devotedly serve Rio Tinto is indeed a difficult one. This is especially the case when Rio Tinto are so exceptionally fortunate in the service which they receive from their many employees. The Board hope that the staff will not feel that the few sentences, which is all that it is possible to devote to an expression of gratitude in each Chairman's Statement, is a proper measure of their appreciation of the hard work and loyalty of all Rio Tinto's employees throughout the year. Though the words may be sparse and arid, the feelings which inspire them are certainly heartfelt.

Obituary

LAWRENCE CARR HILL

Lawrence Carr Hill, who died suddenly on May 4, 1959, in his sixty-ninth year, gave the whole of his working life to Rio Tinto. After his years at the Royal School of Mines (1908-12), where he gained the Brough medal in his final year, he joined Rio Tinto in Spain as a junior mining engineer in 1912.

On the outbreak of World War I, he joined the Royal Engineers, in which he served for nearly five years. His service, in the tunnelling companies, was distinguished by the award of the Distinguished Service Order, the Military Cross, and three Mentions in Despatches. On demobilization with the rank of Major, he rejoined Rio Tinto in Spain, where for the next twenty years he was a valued member of the mine staff, becoming deputy technical manager.

In 1939, he volunteered once more for service in the Royal Engineers, attaining the rank of Lieutenant-Colonel. On demobilization he again rejoined Rio Tinto in 1945 in London as technical adviser to the board. From his retirement in 1952 until his death, he was consultant to Rio Tinto, and was closely connected with the company's activities throughout the world and more especially with the Spanish company, of which he was a director.

Colonel Hill was elected president of the Institution of Mining and Metallurgy for the session 1950-51, and gave much service to that body in various capacities. He served Rio Tinto for nearly forty-seven years, with the exception of the years of his war service. His unfailing kindness, his courtesy, and his wise counsel will be sorely missed by all who knew him.

FREDDIES CONSOLIDATED MINES, LIMITED

(Incorporated in the Union of South Africa)

Statement to Members by the Chairman, **Mr. D. A. B. Watson,** on the Directors' Report and Accounts for the year ended December 31, 1958. (Issued to Members prior to the Fifth Annual General Meeting to be held in the Board Room, Consolidated Building, corner of Fox and Harrison Streets, Johannesburg, on Friday, May 8, 1959, at 11 a.m.):—

Accounts :

For the year 1958 the loss on combined gold and uranium operations amounted to £168,476 (1957—Profit £114,345), made up of a loss from gold mining of £519,476 (1957—£236,355), and a net profit from the production of uranium of £351,000 (1957 — £350,700), after providing £166,796 for amortization and interest charges in respect of uranium loans. Net outgoings after providing for capital expenditure, interest on loans, sundry revenue, interest received, and various other minor items, amounted in 1958 to £202,509 (1957 — net additions, £60,874).

Financial Position :

Net funds in hand at March 31, 1959, amounted to £366,037. During the year 1958 an amount of £200,000 was repaid to the National Finance Corporation, and the balance of £800,000 falls due for repayment between December, 1959, and April, 1960.

Operations — 1958 :

The grade of ore stoped at 326 inch-dwt. was in line with that expected for the year, and the sampled value of all reef development at 319 inch-dwt. compares reasonably well with 328 inch-dwt. for the previous year. Partly as a result of the curtailment of the development programme, the development footage accomplished on reef decreased from 8,975 feet in 1957 to 5,620 feet in 1958, with a consequential effect on pay ore reserves, which decreased from 1,292,000 tons at December 31, 1957, to 1,088,000 tons at December 31, 1958. For reasons set out in the Directors' Report, efforts to increase production during 1958 were not successful, the total fathomage excavated at 70,316 being virtually the same as for the previous year.

Current Operations :

During the first four months of 1959 the rate of stoping was at the rate of nearly 72,000 fathoms per annum; 1,765 feet of development on Basal Reef were sampled, equivalent to an annual rate of 5,300 feet, as compared with an annual rate of 5,620 feet for 1958. At the present time it is considered that the reef development envisaged for the year 1959 should be sufficient to support the stoping programme during the same period. The average value of all development sampled during the four months was 308 inch-dwt. as compared with 319 inch-dwt. for 1958, while the average value of the ore stoped was 310 inch-dwt. as compared with 326 inch-dwt. for 1958.

Notwithstanding the somewhat lower value of the ore developed and stoped during the current year to date, it is still expected that, as stated in the Directors' Report, the average value of the ore stoped in 1959 may be of the order of 310 inch-dwt. to 320 inch-dwt.

During the period May to September, 1958, working losses were at the rate of about £250,000 per annum. During the last quarter of 1958, forward exploratory development and expenditure thereon was to some extent curtailed. Working losses have thereby been reduced and totalled approximately £13,000 during the first four months of 1959.

Two factors might bring about the elimination of the current losses, namely, increased revenue or decreased expenditure per ton. It is not likely that there will in the short term be any significant improvement in the grade of ore milled, nor, in the light of the underground conditions at the mine, is any further material reduction in working costs per ton expected at the *current* milling rate. Provided, however, that the present grade does not deteriorate, an increase in production of about 10 per cent should, under present conditions, enable operations to be carried out at a marginal profit, and this increase in production is being actively attempted.

The relatively small increase in production which is so urgently required has not, as yet, been achieved in spite of all efforts to do so during past years because of the physical difficulties encountered underground at your company's mine, which fall into four main categories, namely: faulting, khaki shale, the presence of underground water-bearing fissures, and high rock temperature, which, at the maximum depth of current workings, is of the order of 108 deg. F. Of these four factors it is the incidence and severity of faulting which has played by far the major part in preventing an increase in production.

In the area served by the North 1 Shaft of Freddies Consolidated Mines, the Basal Reef dips consistently westward as it does in the area developed on Basal Reef by Loraine Gold Mines Limited, in which mine the Basal Reef horizon is relatively undisturbed. To the south of North 1 Shaft, in the area served by the North 2 Shaft, the Basal Reef dips in the opposite direction, namely: to the east, a general trend which persists southward through the remaining area of Freddies Consolidated Mines, where again the Basal Reef horizon is relatively undisturbed. The change in the regional dip of the Basal Reef, from an easterly direction in the area to the south of Freddies Consolidated to a westerly direction in the area to the north of Freddies Consolidated, occurs within the lease area of our mine and is the result of a major geological disturbance which has affected the Basal Reef horizon in a broad zone running through the northern portion of that area. Within this zone the Basal Reef horizon is disrupted and dislocated not only by the major faults which traverse the whole lease area, but also by a multiplicity of minor faults which occur, in general, at intervals of not more than 40 feet to 50 feet.

In the presently operating section of Freddies Consolidated Mines, the total footage developed on reef since inception amounts to approximately 49,000 feet, while development off reef amounts to about 292,000 feet. Approximately 6 feet of development off reef have, therefore, been required to produce 1 foot of reef development. Up to December 31, 1958, the other nine producing mines of the O.F.S. had completed approximately 900,000 feet of reef development, while development off reef amounted to some 2,800,000 feet. Approximately 3 feet of development off reef had, therefore, been required for every foot of reef development as com-

pared with the figure of 6 feet at Freddies Consolidated Mines. It is realized that circumstances vary on each mine and that the figures quoted are averages, but they do give some indication of the severity of the faulting in the particular mining area of Freddies Consolidated Mines, as compared with average conditions in the remainder of the O.F.S. goldfields.

This faulting interferes with mining operations and the development of additional ore reserves, and impedes the efforts made to increase production.

Having regard to underground conditions at Freddies Consolidated Mines, and to the fact that if financially possible the present development programme should be expanded to include some further exploratory development, it is considered unlikely that any *material* reduction in working costs per ton milled can be effected at the current rate of milling, unless there is a marked change for the better in present working conditions.

Future Outlook and Policy:

Notwithstanding the technical difficulties which impede production, it is still considered that these may be overcome during the current year to an extent which will enable operations to be stabilized on a basis of marginal profit or loss, and that they may be continued on this basis for a period of time which will depend upon various circumstances. The earning even of marginal profits would of itself be unrewarding to shareholders and might be considered to be a useless dissipation of the ore reserves of the mine, and it is therefore appropriate at this stage to review the reasons underlying the decision to continue operations for the present even on the basis of marginal loss.

It is necessary, firstly, to examine for how long such operations could be continued without unduly diminishing the quantity of ore remaining in the mine.

The lease area of Freddies Consolidated Mines comprises approximately 8,900 claims. Past operations in the southern portion of the area, in the environs of the South 1 Shaft, disclosed values which were lower than those encountered in the northern portion of the lease area, and, in the light of experience, it is considered that under current conditions the southern portion of the mine cannot be economically exploited, notwithstanding the fact that this portion of the mine is relatively undisturbed by faulting. The remaining and northern portion, which, it is considered, might be underlain by Basal Reef of a value similar to that obtained in development from North 1 and North 2 shafts, comprises some 4,700 claims. In the light of the experience gained from operations so far carried out in the northern area, it is considered that there may still be available therein for milling some 35 to 40 million tons of Basal Reef which might yield some 9 to 10 million ounces of gold.

The first point to be noted is, therefore, that there is available in the more hopeful portion of the mine a very large tonnage of marginal ore sufficient to operate the present reduction plant at its full capacity for a period of not less than thirty to forty years. Provided that there are adequate reasons to continue production, there is no need to consider the cessation of mining operations from the point of view of the exhaustion of the potential ore in the mine.

Although this is the case, and assuming that operations can, in fact, be continued on a basis of marginal profit or loss, this exercise would be of only academic interest to shareholders, unless there were reasons for anticipating that at some stage the profitability of operations might improve. Although a gradual expansion of operations may take place with some consequential improvement of the position, adequate profits will be earned only if there is an improvement in the value of the ore and/or in mining conditions in the unexplored area of the mine, or if there is at some point of time an increase in the price of gold.

While an improvement in grade or mining conditions is not impossible, the regional history of the Basal Reef at the northern end of the O.F.S. goldfields does not give grounds for expecting a general improvement in value within the Freddies Consolidated Mines lease area, although it is not impossible that individual areas of comparative enrichment might occur.

The position with regard to the Elsburg and "B" Reefs is as follows:

Elsburg Reefs:

With regard to the Elsburg Reefs, which are at present being developed by Loraine Gold Mines with satisfactory results, the results obtained some years ago in borehole E.R.K. 1, drilled on the common boundary of Freddies Consolidated Mines lease area and the farm Klein Begin, indicate that Elsburg Reefs do to some extent persist in a southerly direction into the Freddies Consolidated lease area. This borehole intersected Elsburg Reefs at depths of between 4,350 feet and 5,000 feet, and on one horizon a value of approximately 1,000 inch-dwt. was disclosed. Although it has generally been considered that these reefs are likely to "peter out" going in a southerly direction from Loraine Gold Mines, there is a possibility that some limited tonnage of payable Elsburg Reefs may exist in Freddies Consolidated Mines. The development heading nearest to the position of the Elsburg Reefs in Freddies Consolidated Mines is the 18 North 2 Haulage West, which is at present some 6,500 feet from borehole E.R.K. 1. This haulage is now proceeding in the direction of E.R.K. 1, and, if it were driven a further 4,500 feet, it should be possible to test by underground drilling the existence or otherwise of the Elsburg Reefs. This work, if proceeded with, may take about two years to complete.

"B" Reef:

With regard to the "B" Reef, the average value of eighteen intersections of this reef in the surface boreholes originally drilled on the Freddies Consolidated Mines lease area amounted to 133 inch-dwt.: 745 feet were subsequently developed on "B" Reef and gave an average sampled value of 82 inch-dwt. It is known that values in the "B" Reef are very sporadic, and, although certain areas of the "B" Reef within the Freddies Consolidated Mines lease area might be payable, it has been felt inexpedient to divert any of our limited resources away from the development of the more consistent Basal Reef horizon to the development of the more erratic "B" Reef horizon. Although it is felt that the exploration of the "B" Reef does not, in general, warrant a particular programme designed to this end, there is, however, one area which might be considered to be an exception. This area lies to the south-east of the present workings from North 2 Shaft in the neighbourhood of boreholes E.V. 1 and K.K. 1. "B" Reef was intersected in E.V. 1, situated some 3,500 feet from the nearest underground workings, and gave a value of 465 inch-dwt. Borehole K.K. 1, situated 6,000 feet to the south-east of E.V. 1, and approximately 4,500 feet from the nearest underground workings, gave an average value of 381 inch-dwt. In order to prove whether these values are merely erratic high values or whether they indicate a possible payable zone of "B" Reef, a haulage should be driven a distance of about 3,500 feet to borehole E.V. 1. Should future circumstances permit, this work will be carried out.

With regard to the second main possibility, namely: that of an increase in the price of gold, although this is a subject upon which there are many opinions, it is nevertheless a factor that should not be disregarded in deciding upon the present policy of the mine.

If the likelihood of operations being conducted at a reasonable profit, either because of an improvement in the circumstances of the mine with gold at its present price, or because of an increase in the price of gold, is considered too remote to be real, then there would be little purpose in continuing operations on a marginal basis. Your Directors consider, however, that the possibilities are sufficiently real to be taken into consideration in arriving at the important decision with which they are faced, namely: whether the shareholders' interests are best served by:

(*a*) shutting down the mine and disposing of the assets, or
(*b*) by keeping the assets intact.

It is estimated that if it were decided forthwith to close down the mine, to extract such ore reserves as might profitably be extracted, and sell such assets as could be sold, the net amount remaining for distribution to shareholders after meeting the costs of closure and the realization of assets, and after discharging the company's indebtedness, might be of the order of £1½m., say, 2s. per share. It will be appreciated that it is difficult to estimate exactly what sum would, in fact, be available, as much depends upon whether or not willing buyers could be found for the assets to be sold.

The point of decision before the Board is whether it is in the interests of the majority of shareholders that the assets of the company should now be realized, with a resultant distribution to shareholders of possibly 2s. per share or whether it is in their interest to forego the return of 2s. per share at this stage, while the company continues with its present programme. This programme envisages that the company can be retained in being without material loss, while continuing to explore the potential of the mine and awaiting either an increase in the price of gold or an opportunity to utilize to advantage the present assets of the company.

Having regard to the possibilities which have been set out above, it is the present opinion of the Board that the company should not be put into liquidation, and that its assets should *not* be sold at this stage.

In the light of this decision, the choice then rests between the alternatives of:

(1) closing down the mine, selling certain of its assets, and placing it on a caretaking basis,
(2) continuing operations on a marginal scale of profit or loss for as long as possible.

If the main hope for profitable operations lies in a future increase in the price

of gold, then it is open to question whether it is necessary to continue to explore and exploit the mine *at this stage* or whether such exploration should not be left for the future when and if such an increase in price takes place.

If it were possible to close down the mine, to retain the company's mining title, etc., and to re-enter the mine at a later stage without undue expenditure, it is probable that immediate closure would be the most sensible course to follow. It is, however, not possible to abandon and subsequently to re-enter the mine without considerable expenditure, firstly upon closure, secondly and over an unspecified period upon caretaking and the maintenance of mining title, and finally upon reopening the abandoned mine. It is, therefore, considered advisable meanwhile to continue operations on a narrow margin of profit or loss rather than to face what might be an equivalent expenditure on closure and caretaking.

I have dealt at length with some of the factors which have been taken into account by your Directors in considering the problems of policy with which they have been faced. The foregoing consideration of these problems in their technical and financial aspects has been based solely on the criterion of the shareholders' interests. The national problem related to the desirability of winning the large quantity of marginal gold contained within the lease area, the regional problem of the impact of closure upon the district, and the individual problems of the employees concerned, have not influenced the views of your Directors up to this point of time. If and when the shareholders' interests appear no longer best to be served by a continuance of mining operations, then at that stage, should it arise, these problems will no doubt have to be considered in discussion with those concerned, together with other factors affecting the circumstances of the company at that stage.

I trust that the comments and views set out in this statement will serve to facilitate an understanding of the lines of thought which have guided your Directors in arriving at their present conclusion, which is that operations should continue for the present, provided that the total net outgoings of the company's funds can be kept at reasonably low levels.

In conclusion, I wish to express our appreciation of the services rendered by the manager of the mine, Mr. C. J. Shaw, and by the staffs at the Mine and at Head Office, and once again to express our particular appreciation for the efforts of all those on the mine who in the face of the greatest difficulties and very severe mining conditions continue their energetic attempts to overcome these difficulties and to bring production on to a profitable basis.

May 5, 1959.

Skinner's Mining Year Book

One of the signs of spring in the city is the annual appearance of *The Mining Year Book*, compiled by Walter E. Skinner. This year, indeed, new, bright red covers point the connection more emphatically than ever.

Between the covers, however, "Red Skinner" is the same indispensable reference book as ever. No changes have been made in the layout.

The Mining Year Book is published by Walter E. Skinner, 20 Copthall Avenue, E.C.2, and costs 42s. 6d. post free.

BRITISH ALUMINIUM COMPANY

RESULTS AFFECTED BY ADVERSE CONDITIONS

IMPRESSIVE OPPORTUNITIES FOR EXPANSION

The Annual General Meeting of The British Aluminium Company, Ltd., will be held on May 26 at Grosvenor House, Park Lane, London, W., at 12 noon.

The following is the statement by the Chairman, **Sir Ivan A. R. Stedeford, K.B.E.,** circulated to shareholders along with the Managing Director's report with the report and accounts for 1958:—

Board Changes

There is no need for me to recapitulate here the events which took place around the end of 1958, about which you have already been fully informed, and which finally resulted in an important change in the control of this Company.

This change led to Lord Portal and Mr. Geoffrey Cunliffe leaving the Board on February 17 last, and to their relinquishing at the same time their other appointments with the Company and its associates.

The two Board vacancies thus created were filled by Mr. Richard S. Reynolds, Jnr., President of the Reynolds Metals Company of America, and me, and following my appointment your Directors elected me Chairman of the Company.

At an Extraordinary General Meeting of members held on April 1, 1959, the number of directors permitted by the Company's Articles of Association was increased from twelve to sixteen. Mr. J. Louis Reynolds, Chairman of Reynolds International Inc., and Major-General Sir Francis de Guingand, K.B.E., C.B., D.S.O., were then appointed Directors.

During last year Mr. J. J. Boex was appointed to the Board. Mr. Boex joined the Company early in his business career. He is of the younger generation, and is to be congratulated on having qualified for this position of honour and responsibility.

Lord Portal's years of service as Chairman have clearly won for him the loyalty and admiration of all who served him. His term of office and services to the Company will long be remembered and respected.

You will, I am sure, wish me also to record your recognition and thanks to Mr Cunliffe for his devoted services to the Company extending over a period of twenty-six years, during fourteen of which he was a Managing Director.

A Difficult Year

The year 1958 was generally a difficult one for the aluminium industry everywhere, and not only for companies engaged in it in the United Kingdom.

Competition, always keen in this industry, intensified as demand weakened during a period when new and additional capacity was coming into production. The impact of these conditions was particularly severe in export markets, where orders fell away sharply and prices too often were only marginally attractive.

Trading Profits

These adverse trading conditions, as might be expected, are clearly reflected in our own results. The consolidated trading profit of the Company, after depreciation at normal rates and transferring £120,000 (1957—£200,000) to plant replacements reserve, was £2,105,394 (£3,020,706) a reduction of £915,312 or over 30 per cent.

The severity of this decline in trading profits was, however, softened to some extent by an increase in investment income of £141,178, and lower bank and interest charges of £119,666. The total net income for the year, before providing for taxation was therefore £2,210,266, a reduction of £654,468.

Dividend Policy

In the difficult trading conditions I have mentioned, and judged by the experiences of other large companies engaged in similar activities, the profits for the year can be regarded as not unsatisfactory. This does not alter the fact, however, that we have had a poor year and that it is with less satisfaction that we have paid a total ordinary dividend of 17½ per cent., an increase over last year of 5½ per cent.

To pay a dividend at this rate absorbing as it does the whole of the year's available trading profits, is, in my view, unjustified. We have done so for this year only to conform with the conditional undertaking given by the Board last December in respect of this dividend.

I wish to make it clear that any ordinary dividends paid for the current and subsequent years will be in accord with a sound financial and dividend policy based on ascertained results. I should add, therefore, that, in my opinion, it is highly improbable that a dividend at this rate can be repeated for the current period, and that it is impossible to forecast now when it might be justified.

During the year the price of aluminium ingot was reduced by as much as £17 per ton, a very costly step for the producers to take and the justification for which is shrouded in doubt.

Importance of Surplus Capacity

I am addressing you at a time when the world is talking about a surplus of aluminium, but we must be careful we do not look at this situation from the wrong end of the telescope. What is really happening now is that, for the first time in a generation, the world has an abundant supply of the metal, with still more capacity planned, in construction, and coming into production.

The difficulties in this situation are obvious, but so are the possibilities of great advantage for the industry to exploit.

A factor, soon forgotten, which in the past has seriously inhibited a natural growth in the use of aluminium, and particularly in the United Kingdom, has been the shortages of supplies which until recently, have persisted for so many years. Development of the industry in this country has been seriously retarded by these conditions.

Long Term Prospects

Of the long term prospects of the metal, we are beginning to see the shape of things to come. The use of aluminium in America, for instance, is far and

away ahead of consumption here and elsewhere, and the industry sees impressive opportunities for further expansion.

Whilst, therefore, the phase of metal shortages has now passed, the industry is nevertheless planning further increases in production in order to ensure keeping a step or two ahead of future demand. Whilst from an earnings point of view this policy, in the short term, has its disadvantages, it makes certain that, for the future, aluminium will be able to compete with other metals for about the first time on its merits.

This is a glowing long term prospect which The British Aluminium Company's newly acquired resources in all fields will permit it vigorously to exploit. It is in this general context that I look ahead with confidence.

VIRGINIA ORANGE FREE STATE GOLD MINING COMPANY, LIMITED

(Incorporated in the Union of South Africa)

INCREASED TONNAGE MILLED

MR. S. G. MENELL'S REVIEW OF ACTIVITIES

The 10th Annual General Meeting of Virginia Orange Free State Gold Mining Company Limited will be held on June 4 in Johannesburg.

The following is the circulated statement of the chairman, **Mr. S. G. Menell:**

The tonnage milled during the year increased by 69,000 tons to 1,256,000 tons, but the recovery grade of 5.240 dwt. per ton was 0.092 dwt. per ton lower than in the previous year. The decrease in grade coupled with an increase of 4s. 10d. per ton milled in the working costs adversely affected the profit from gold production, which at £516,983 was £321,236 less than in the previous year. The tonnage treated for uranium oxide decreased by 287,495 tons to 1,256,000 tons, due to the exhaustion of accumulated slime. During the year under review your mine produced 635,279.5 lb. of uranium oxide at a recovery grade of 0.506 lb. per ton treated. The working profit from uranium production increased by 2s. per ton treated, but the smaller tonnage treated resulted in the profit from this source decreasing by £257,751 to £1,797,834. The working profit from acid production increased by £53,556 to £352,173. The total working profit from all operations for the year was thus £2,666,990. After the addition of Sundry Revenue, £2,499, and the deduction of Debenture, Loan Stock and other interest amounting to £488,496, the net excess of income over expenditure for the year was £2,180,993, a decrease of £512,729 compared with the previous year.

The capacity of the reduction plant has been increased from 130,000 tons to 150,000 tons per month. The rate of production will, however, depend on such factors as the results obtained from development and the availability of native labour. It is expected that a milling rate of 125,000 tons per month will be attained by the middle of 1959.

Under an agreement between the South African Atomic Energy Board and the Combined Development Agency, the sale of uranium oxide by all producers to the Agency is restricted to 6,200 tons per year. The quota granted to your mine for the year ending December 31, 1959, is 649,760 lb.

Development and Ore Reserves

Number 2 shaft, of which I made mention in my review last year, was sunk to its final depth and was concrete lined and equipped. The permanent headgear was erected and hoisting of rock in this shaft commenced during September, 1958. With the commissioning of this shaft, mining operations have expanded, the tonnage milled has been increased and development of the upper levels is now in progress.

Development footage was increased by 9,160 feet to 72,253 feet, including 3,613 feet accomplished in the Virginia property for Merriespruit (Orange Free State) Gold Mining Company Limited. In addition, 7,318 feet of development were done for the Merriespruit company in that company's lease area. Footage sampled increased by 4,100 feet to 33,945 feet. A large portion of the reef development was advanced in the south-western portion of the mine, where payability and values have proved to be lower than in the area developed north of No. 1 shaft. Payability declined from 49 per cent to 36.1 per cent, and the gold and uranium oxide values decreased from 393 inch dwt. and 38.26 inch lb. to 319 inch dwt. and 26.64 inch lb. respectively.

Despite the decrease in payability, the ore reserve has increased by 206,000 tons to 2,292,000 tons, but the gold and uranium values have dropped by 0.32 dwt. per ton and 0.072 lb. per ton respectively, and the estimated stoping width has decreased by 1.9 inches.

The programme to increase the underground pumping capacity to 15,000,000 gallons per day was completed. During the year the average pumping rate was 6.5 million gallons per day.

Capital Expenditure

Capital expenditure during the year totalled £1,386,658, the major items of which were:

Excess development	£427,665
Shaft sinking and equipment	£118,197
Additional underground pumping capacity	£189,190
Underground equipment ...	£104,624
Hoists and headgears	£105,959
Extensions to reduction plant	£198,796
Uranium and acid plant ...	£212,271

Capital expenditure for the current year ending December 31, 1959, is estimated at £800,000.

At the last annual general meeting I mentioned that proceedings had been instituted in the Supreme Court against your company and Merriespruit (Orange Free State) Gold Mining Company Limited, to restrain your company from discharging underground water into a pan, known as Doornpan, which lies north of your company's mining lease area. The action, which has been brought by the owner of mineral rights in respect of one of the farms forming the pan, is still pending, and as Merriespruit (Orange Free State) Gold Mining Company Limited has no interest in the pan, it has been indemnified by your company and the other companies using the pan.

MERRIESPRUIT (O.F.S.) GOLD MINING COMPANY, LIMITED

(Incorporated in the Union of South Africa)

PROGRESS OF MINE DEVELOPMENT

MR. S. G. MENELL'S REVIEW

The 10th Annual General Meeting of Merriespruit (Orange Free State) Gold Mining Company Limited will be held on June 4, at Anglovaal House, 56 Main Street, Johannesburg.

The following is the review by **Mr. S. G. Menell,** the Chairman, which has been circulated with the report and accounts:

In accordance with the programme for bringing the mine back into production, outlined in my review for the year ended December 31, 1956, progress was made in driving the twin haulages on the 28th level from the adjoining Virginia mine into your property. Although progress was retarded by the intersection of water-bearing fissures requiring cementation, the twin haulages crossed the common boundary during April, 1958, and on March 31, 1959, the haulage and its companion had advanced to 5,040 feet and 4,622 feet respectively inside the Merriespruit property. Approximately 4,000 feet remain to be driven to the vicinity of No. 1 Shaft.

To obtain structural and stratigraphical information it was decided to drill boreholes upwards from the haulage. The haulage is overlain by a sill and the Basal reef, which in this area lies above the sill, was intersected in all the boreholes drilled. Twenty-two boreholes were drilled up to December 31, 1958, and of these, fourteen indicated payable Basal reef averaging 375 inch dwt. of gold and 19 inch lb. of uranium oxide over a channel width of 44 inches.

Basal Reef Development

Since the close of the year to March 31, 1959, a limited amount of development on Basal reef has been accomplished approximately 1,300 feet south of the common boundary between your mine and the Virginia mine. Of 285 feet sampled, 195 feet (68.4 per cent) were payable at an average value of 5.46 dwt. per ton of gold and 0.374 lb. per ton of uranium oxide over a channel width of 42.7 inches, equivalent to 233 inch dwt. and 15.98 inch lb. respectively.

In terms of the contract entered into with Virginia Land & Estate Company Limited, for the sale of the mine housing, an amount of £1,200,000 has been received. The balance of £500,000 will be paid when your mine resumes normal gold production.

Expenditure during the year, after allowing for recoupments, amounted to £348,853, of which £218,931 was expended on development.

At the last annual general meeting I mentioned that proceedings had been instituted in the Supreme Court against your company and Virginia Orange Free State Gold Mining Company Limited, to restrain them from discharging underground water into a pan known as Doornpan, which lies north of your company's mining lease area. As your company has no interest in the pan, it has been indemnified by the present users in regard to these proceedings, which are still pending.

Publications Received

Geological investigation of the Pre-Cambrian rocks on the Northern Rhodesia side of the Kariba Gorge, together with a geological reconnaissance of those on the Southern Rhodesia side in the vicinity of Kariba Dam is comprised in a report produced by the Northern Rhodesia Geological Survey Department. The author of *The Geology of the Kariba Area*, is Brian Hitchon, B.Sc., Ph.D., F.G.S. The need for the investigation arose primarily from the decision of the Federal Government to dam the Zambezi River and construct a hydro-electric power scheme which will inundate part of an area that had not previously been geologically investigated.

★

Issued under the authority of the Hon. A. M. Moir, Minister for Mines, *The Gypsum Deposits of Western Australia* is a report published by the Department of Mines as Bulletin No. 6. Some of the deposits are being exploited as a source of the State's requirements of Plaster of Paris, though only those favourably situated with respect to transport facilities are being worked. The authors, L. E. De La Hunty, B.Sc., and G. H. Low, B.Sc., have arrived at an approximate figure of 30,000,000 tons as representing the reserves of commercial grade gypsum in the area examined.

★

Selected bibliographies of uranium geology are presented in *Selected Annotated Bibliography of the Uranium Geology of Igneous and Metamorphic Rocks in the United States*, published by the United States Department of the Interior. This compilation, Geological Survey Bulletin 1059-E was done on behalf of the U.S. Atomic Energy Commission and is published with the permission of the Commission.

★

'Terylene' Saves is a booklet produced by Imperial Chemical Industries Ltd., and recalls some of the most notable developments which 'Terylene' has made possible in industry during the last few years. The booklet includes a special mining page which emphasizes the use of 'Terylene' for improved performance in conveyor belts.

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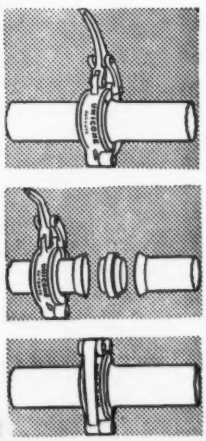

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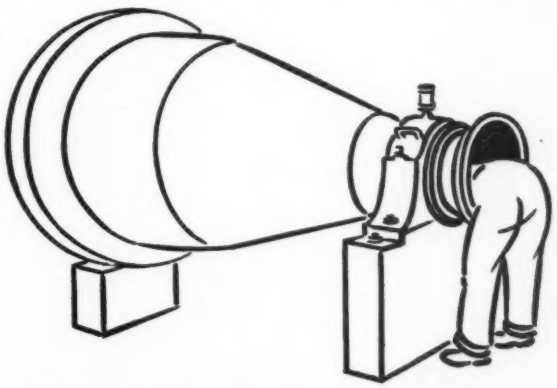

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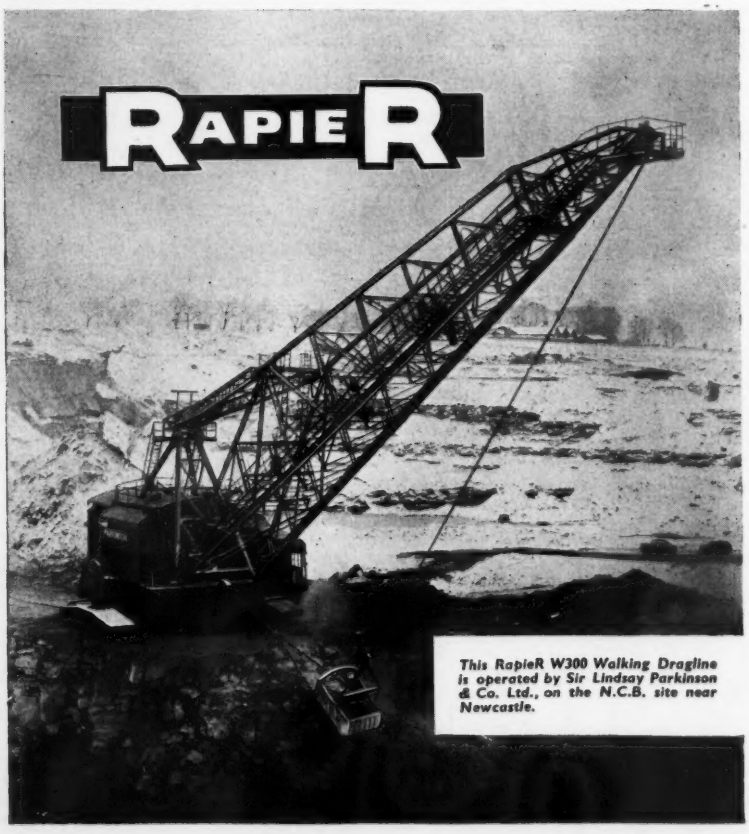

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